APRIL, 1961

# ADHESIVES AGE

MANUFACTURE, APPLICATION, TECHNOLOGY, RESEARCH AND MARKETING

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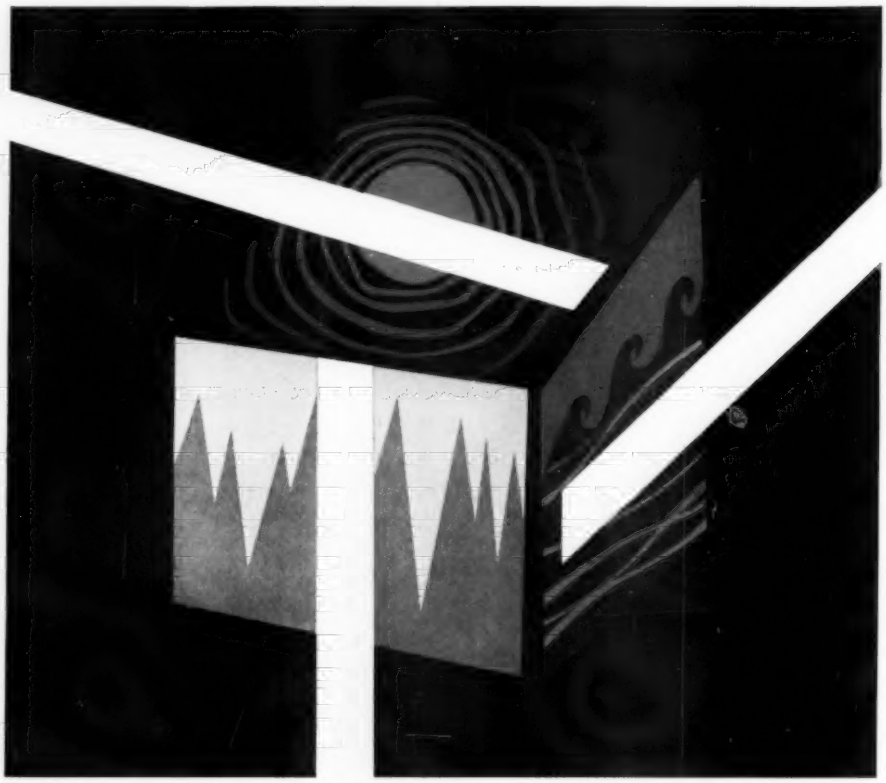
**SILICONE NEWS from Dow Corning**

# Sticks Here...Here...Here



## In Heat, Cold and Moisture Silicone Adhesives Hold!

The exceptional durability of Dow Corning pressure sensitive silicone adhesives makes them dependable for tapes, sealants, spray-on coatings, bonding materials and splicing agents. Perhaps there's a special property you need in an adhesive . . . or a special *combination* of properties? Here, briefly, are the properties of Dow Corning silicone adhesives. Silicones may offer exactly what you need.

***They stick anywhere!*** At temperatures ranging from —80 to 500 F, pressure sensitive silicone adhesives stay stuck and don't deteriorate. They withstand the effects of moisture, oxidation, corrosive chemicals, weathering, arcing, corona and fungus. For electrical applications, silicone adhesives provide excellent dielectric strength.

***As tapes.*** Dow Corning silicone adhesives are used with most backing materials. Now readily available from several manufacturers are tapes with backings of glass cloth, Teflon, Mylar, aluminum foil, silicone rubber and combinations of these materials. Typical applications include: high temperature electrical insulation; bonding, splicing, and sealing; masking in chemical milling; release surfacing, and electroplating.

***Or alone.*** For a fastening adhesive in rugged service, silicones may be your answer. For example, silicone adhesives in combination with asbestos fibers are used to coat and insulate hot air ducts in aircraft. Other tough applications: sealing ends of heat elements in appliances, bonding mica and asbestos panelboard, and bonding silicone rubber to the coils of electrical equipment.

Dow Corning Silicones may well be your adhesive of the future. For more technical information or assistance, **write Dept.** 0116.

Available now — list of manufacturers supplying pressure sensitive tapes with silicone adhesives.

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aa ADHESIVES AGE

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We asked our artist if he could contrive some means for conveying at a glance the wide variety of adhesive bonding problems and applications that are dealt with in this issue. After some preliminary sketching, he laid out a red carpet for some of the end products featured in the following pages.

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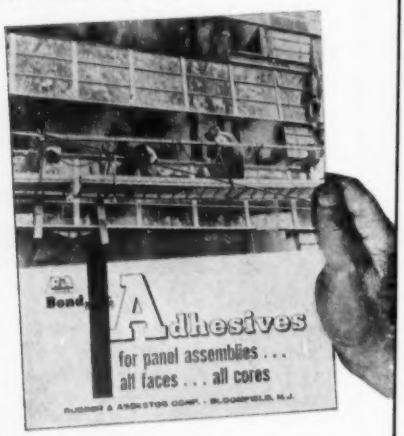


Profusely illustrated, 16-page Brochure No. 135 describes adhesives and production methods used in manufacture of curtain wall and other panel assemblies consisting of a variety of cores and faces. Contains test data and details of mass production bonding techniques. *Send for your free copy today.*

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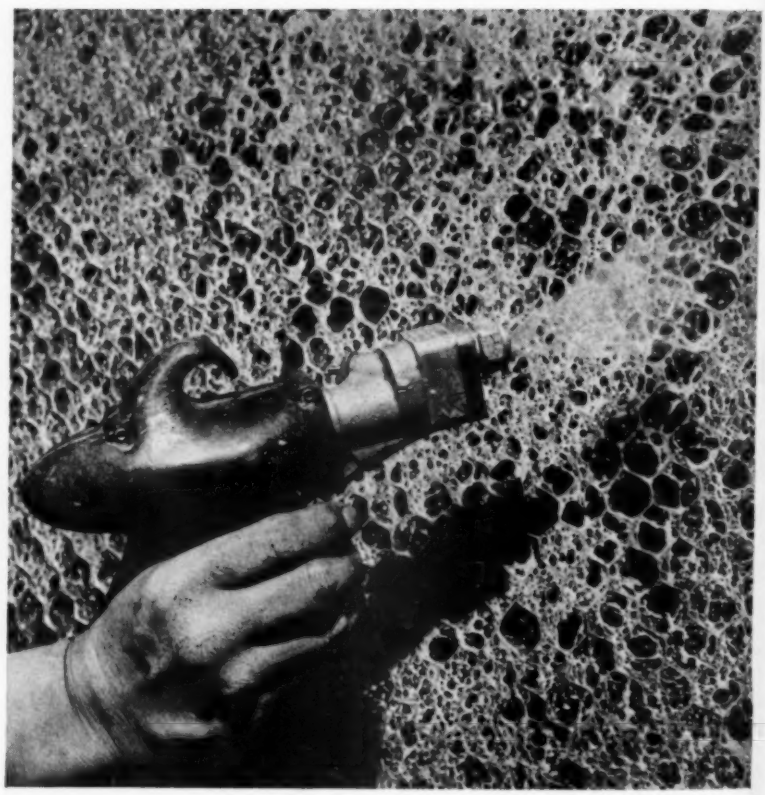

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BONDMASTER G586-20 is one of a group of formulations (see column on far left) we manufacture for the bonding of just about every type of panel produced today (paper, wood, plastic, or metal cores and/or faces).

### WRITE FOR FURTHER DATA

Detailed data on the full range of BONDMASTER "G580 Series" panel adhesive is yours for the asking. We'll be glad to send a free evaluation sample as well if you will describe your specific bonding problem in detail.

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# EDITORIAL

## A Camelot is Not a Play

The French have a word for it. A spieler, a hawker, one who sells merchandise on the streets and couples his sales with an "educational" talk is a camelot. The camelot is given to exaggerated claims, much verbiage and, oddly enough, often has startling insight to man's frailties and the snobberies of the moment. Do you know what his sales clincher might often be? "And listen friend, *it's made in America!*"

We, on this side of the Atlantic, are often given to the same sentiments. We often attribute qualities to foreign-made goods, qualities which are not substantiated by fact in many cases. By this circuitous route we get to adhesives.

Who has not heard it said that foreign adhesives technology is superior to ours? Who has the evidence that this is so? Are we not indulging in some form of camelot-ism? Who has not heard it said that foreign adhesive products stick better, or last longer than ours? Camelot-ism?

The truth of the matter is, we see more of foreign merchandise (including adhesives) than they see of ours. Be that as it may, it is a sorry situation when snobbery, rather than superiority, sells products. Snobbery adds nothing to a chemical bond.

Foreign consumers, moreover, do not have an opportunity to evaluate American adhesive products because they do not see enough of them. In most cases this is so because American manufacturers have made little effort to sell their products abroad. Producers of many domestic products (including adhesives) often make the point that we cannot compete because of lower wage rates, etc., etc., etc. Nonsense. A recent United States trade mission found that most French products are higher priced than comparable products on American shelves.

Why then this hesitancy about getting into foreign markets? Do we believe with our camelots that foreign adhesives technology and foreign adhesive products are superior? Do we really believe that the French, the Danish, the German and the Italian manufacturers make better adhesives than we do? Better machinery? Better equipment? Better raw materials? Have we nothing to export but money? Do we pay too much attention to our own camelots?

Let us put it in the vernacular of the camelot: "Friends, the time has come to get aboard . . . Get on the bandwagon, buddy, or the parade will pass you by . . . Come on in boys, the water's fine!"

Sodium silicates, low cost inorganic adhesives, fit a wide range of bonding applications . . .

**LAMINATING:** paper to paper, wood to paper, wood to wood, wood to felt, metal foil to paper, asbestos to asbestos, mica sheets, cork, vulcanized fibre.

**FLOCKING:** rayon, cotton, cellulose, metallic glitter to various surfaces such as paper, cards, spruce, hemlock, balsam, and pine branches.

PQ silicate bonds are strong, fireproof and vermin resistant. Try a PQ silicate for one of your pasting operations.

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# CONSULTANT'S CORNER

By Dr. Irving Skeist

## Bonding Metal-to-Tile

**Question:** We are interested in obtaining an adhesive for attaching a metal container to plaster and ceramic tile walls. Some time ago we saw small perforated plates with studs mounted on them that would be ideal for our application if the adhesive would hold permanently. Any information you can give us would be appreciated.

**Answer:** One of the strongest adhesives for this application would be an amine-cured epoxy. Please see Question 185 for further details and precautions.

An epoxy combination, however, requires time to develop full strength — at least several hours, and preferably one day. If you cannot tolerate this wait, you can get moderate strength from a neoprene contact cement. Either the epoxy or the neoprene should be applied to both surfaces. The epoxy is 100 per cent non-volatile, so that the two surfaces can be mated immediately. In the case of the neoprene cement, however, it is necessary to wait until the solvents have evaporated before putting the two surfaces together. *Q-189*

## Protection Against Dermatitis

**Question:** I am making containers from plywood, using fiberglass tape and a polyethylene plastic at the joints — inside and out. We experimented with epoxies and thought they were the answer until several of our personnel became sensitive to them. What resins that are non-sensitive would have good tear resistance?

**Answer:** The epoxies would seem to be quite suitable for this application from every point of view except the sensitivity of your personnel. In using epoxies, however, it is necessary to follow good housekeeping procedures zealously. Personnel should not be allowed to get resin or hardener on their hands. Inexpensive gloves made from heat-sealed polyethylene film are now available. They are so cheap that they can be discarded when they become contaminated. For comfort, a cotton glove can be worn on the inside.

It is usually the hardeners rather than the epoxies themselves that are responsible for skin irritation.

If you have been using hardener in a ratio of approximately ten parts per 100 parts epoxy resin, the chances are that your hardeners are of the aliphatic amine variety. These cause the greatest difficulties because they are the most volatile and penetrate the skin most readily.

At least two of the epoxy resin manufacturers (Union Carbide and Shell) have developed hydroxyethylated amines which have low irritation potential. Also, the flexibilizing amines, such as Versamid polyamide (General Mills) and Lancast A (Ciba) are relatively safe to handle.

Unfortunately, people who have been sensitized should not continue to work on epoxies, even with less allergenic curing agents. You have probably noted that fair-skinned people are more prone to sensitivity than others.

The cardinal rule for safe handling of epoxies has been summarized by one manufacturer in five words: "No skin contact — no eczema." *Q-185*

## Fiberglass-Wood Archery Bows

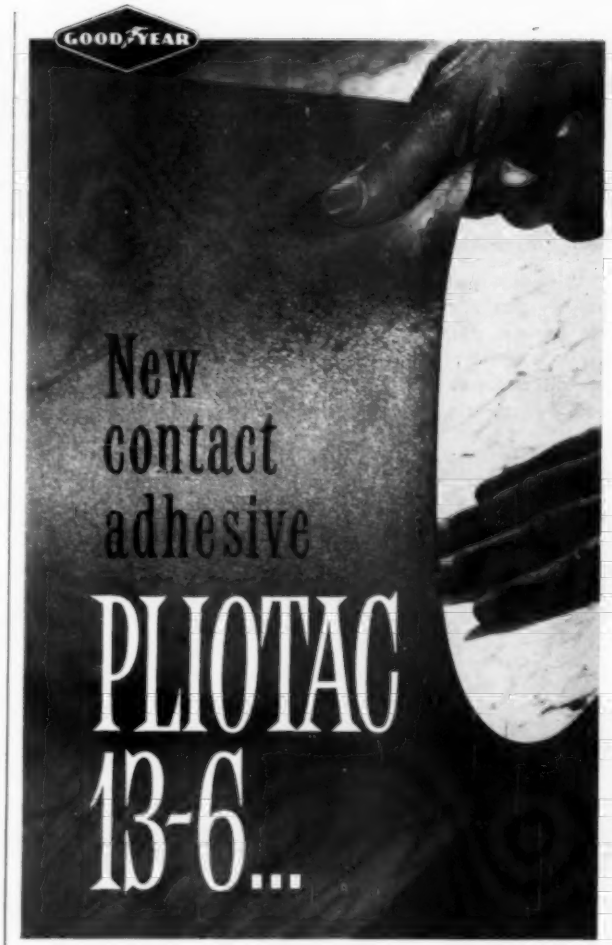
**Question:** Could you give us a recommendation on what type of clear or colorless adhesive or group of adhesives to use for laminating archery bows. They consist of outside layers of fiberglass reinforced plastic and two strips of maple coring, with tropical hardwood handle section. The adhesive we have been using, while excellent, has reacted with the epoxy finish and caused it to yellow. Also, its color and staining properties showed between the inlays of the handle section.

The adhesive must resist cold temperatures under great stress, be moisture-proof, and free from age enbrittlement. In addition, processing or mixing and application must be as simple as possible.

**Answer:** Since your problem is yellowing of the epoxy finish by the adhesives, you might try switching to an epoxy adhesive. There are two-part compositions which must be mixed just prior to use. However, this is not a difficult task. They can be measured out in baker cup according to either volume or weight and mixed thoroughly with wooden tongue depressers. On a larger scale, there is equipment available for the automatic metering and mixing of epoxies to give you the same amount of "shot" each time.

The easiest procedure for selecting an epoxy is to put yourself in the hands of a reliable supplier, asking him to give you the two components packaged in the right proportions and amount for your production schedule. In this way, the material will be used up well within its pot life, with a minimum of waste. If you wish to do the mixing yourself, I would suggest a combination of epoxy resin with a flexibilizing curing agent, for example, a Versamid polyamide, Lancast A, or a combination of liquid Thiokol and an amine. Please note also the answer to Question 185. *Q-184*

Dr. Skeist is associated with Skeist Laboratories, Inc., 89 Lincoln Park, Newark 2, N.J. He is the author of the recently published book, "Epoxy Resins."

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# new adhesives
AND ADHESIVE PRODUCTS

### Self-Adhesive Foil

Self-adhesive stainless steel foil is now available for use where fastening of steel strips or panels might prove a problem, or where the use of foil in combination with other backing materials would be more

economical. The .003-inch foil can be applied to almost any clean, smooth, dry surface. Initial contact adhesion will range from two to four pounds per inch with a build-up in strength of 60 to 75 per cent or more during the first three days. The bond is said to be effective at from —50°F. to 300°F. Shelf life of the material is estimated at two years or more by the manufacturer. The self-adhesive foil's resistance to salt water corrosion makes it available for marine use. In tests, the adhesive bond actually increased in strength after 60 hours immersion in water at 75°F. *Fasson Products.* **P-472**

### Carrier Starch

Kobond H is a new grade of corrugating carrier starch which is precooked and needs only mixing to prepare it for use. The high viscosity of the cold-water-swelling starch is said to permit greater economy by reducing the number of pounds of starch required. The manufacturer claims that it stands up even under the most severe conditions of shear which occur in circulating pumps to and from the combiner. *National Starch and Chemical Corp.* **P-473**

### Static-Conducting Adhesive

Rez-N-Glue 159 is a synthetic rubber-base adhesive which is said to provide excellent specific adhesion to metals, glass, some plastics and most porous materials. Each coat produces an approximately two-mil thickness of static-conducting surface. The resistance of the black adhesive coating to oil, gasoline, water, heat and cold is said to make it particularly well suited for use as a protective coating against rust and corrosion. Two or more brush coats should be used and one hour drying time allowed between coats. The tough, elastic coating produced is said to become progressively tougher and more heat resistant over a period of months. *Schwartz Chemical Co.* **P-474**

### Ceramic Tile Adhesive

Designed for installing ceramic tile on exterior surfaces such as curtain wall panels, Miracle MA-450 is a high strength, waterproof, rubber-base adhesive with non-oxidizing resins. It is said to bond to any rigid, dry, hard, clean surface. Recommended surfaces are concrete, metal, cement asbestos board, Unarcoboard, or other weatherproof material structurally strong enough to support the weight load. Coverage is given as approximately 50 square feet per gallon, and open time is up to one hour depending on temperature and humidity. *Miracle Adhesives Corp.* **P-475**

### Neoprene Adhesive

Sections of latex or polyurethane foam rubber can be bonded with M-6479, a clear, neoprene base adhesive. The special formulation utilizes a delayed setting time, and is said to afford a dimple-free bond when only a slight pressure is used to make the joint. The completely dry joint is stronger than the parent foam material. *United States Rubber Co.* **P-476**

### Metal-to-Metal Adhesive

Supplied in continuous rolls 18 inches wide, Metlbond 408 is a dry adhesive for use in high strength, metal-to-metal bonding applications. It is a 100 per cent solids, modified epoxy resin system and contains no

solvent or cloth-type carrier. No priming agent is necessary on metal or honeycomb core faying surfaces. Sheets of dry film can be cut to shape and interposed directly between the surfaces to be bonded. The adhesive is cured in an oven or autoclave at 350°F. for approximately one hour. Only pressure sufficient to keep the parts pressed firmly together during the cure is required. As the temperature approaches the cure level, the adhesive softens, flows and wets the surfaces, filling small voids and imperfections. Since no volatiles are released, there is said to be no danger of voids, blisters or bubbles within the bond area. Metlbond 408, with its room temperature shear strength of 6500 psi, exceeds the minimum requirements of MIL-A-005090D. Metlbond 408 produces a glue line with an average thickness of 0.005 inches. *Narmco Materials.* **P-477**

### Waterproof Cloth Tape

Available in brown, blue, green yellow, maroon, red, black and white, C-504 Waterproof Cloth Tape is a plastic-coated material with a high tack, pressure-sensitive adhesive based on reclaimed rubber. It has an adhesion to steel and backing of 40 ounces per inch. Its tensile strength is 55 pounds per inch width. The tape's resistance to aging is said to make it particularly valuable to small quantity users. *Arno Adhesives Tapes, Inc.* **P-478**

# 3 VERSATILE POLYMERS FOR ADHESIVES AND SEALANTS!

## VISTANEX® LM

## BUTYL

## VISTANEX MM

**VISTANEX LM**
Polyisobutylene polymers of viscous, soft, gummy consistency having average molecular weight range of 8,700 to 11,700.

**BUTYL**
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Polyisobutylene polymers having a high degree of elasticity and average molecular weight range of 64,000 to 135,000.

These polymers, because of their excellent resistance to aging, ozone and chemicals, viscosity stability over wide temperature range, and their permanent tack, offer the compounder great latitude in designing and formulation for:

- Cements
- Pressure sensitive adhesives
- Laminating adhesives
- Caulking and sealing compounds
- Tackifiers
- Blending with polyethylene or wax

Also for other applications such as: impregnating leather, binder for eraser compounds and base for paints.

**FOR INFORMATION** on any of these materials contact Enjay at 15 West 51st Street, New York 19, N. Y.

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### Foam Tape

Resonant vibration is said to be reduced with Scotchfoam tape Y-9052 which consists of specially compounded polyurethane foam

with an embossed vinyl plastic backing and a pressure-sensitive adhesive underside. The tape can be applied by removing a protective liner and applying the adhesive-coated side using finger pressure to make sure that close contact is established with the vibrating object. The bond formed is so firm that the foam will split if removal of the tape is attempted. *Minnesota Mining and Mfg. Co.* **P-479**

### Removable Labels

A new line of labels introduced uses K-6, a new pressure-sensitive adhesive formulation for which superior removability characteristics are claimed. The labels are presently available in three stock materials: white gloss; Flex, a limp durable paper with resistance to grease, heat, water, soap and dilute acids; and WLP, a lightweight paper stock adaptable for curved surfaces. Since adhesiveness is lowered to improve removability, the labels are not recommended on rough or sharply curved surfaces. *Avery Label Co.* **P-480**

### High Temperature Adhesives

Raiseal 100, 200 and 300 are a new class of adhesives, sealants, and encapsulants developed especially for the missile, electronics and aircraft industries. They are engineered specifically for use at elevated temperatures up to 1000°F.

Raiseal 100 is a two-part compound based on RTV silicone rubber. It can be used in pressure and weather sealing at temperatures from —100°F. to over 700°F. Lap shear tests showed strengths in excess of 300 psi as measured at 700°F. after a one-hour soak at 700°F. and 60 psi. The cure cycle is 48 hours at room temperature.

Raiseal 200 is a one-part putty-like compound for sealing and encapsulation at temperatures in excess of 800°F. The cure cycle is two hours at 300°F. Raiseal 300 is a two-part, ultra-high temperature, rigid adhesive for structural use at temperatures in excess of 1000°F. It is said to have greater impact resistance and flexibility than phenolic or epoxy formulations. In addition, the manufacturer claims that it is far less brittle than comparable high temperature ceramic adhesives. A lap shear test at room temperature, after soaking for one hour at 1100°F., showed a strength of 130 psi. The cure cycle of the formulation is two hours at 300°F. *Radiation Applications, Inc.* **P-481**

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### Contact Adhesive

A new contact adhesive, Clairstick, is designed for bonding decorative and other laminates, wood, paper, and metals. According to the manufacturer, Clairstick gives instantaneous tack with a long open time. In addition, it is said to have a coverage of 300 square feet per gallon, and provides a fast, strong, elastic and permanent bond. It can be applied by spray, brush, trowel, or paint roller. *St. Clair Rubber Co.* **P-484**

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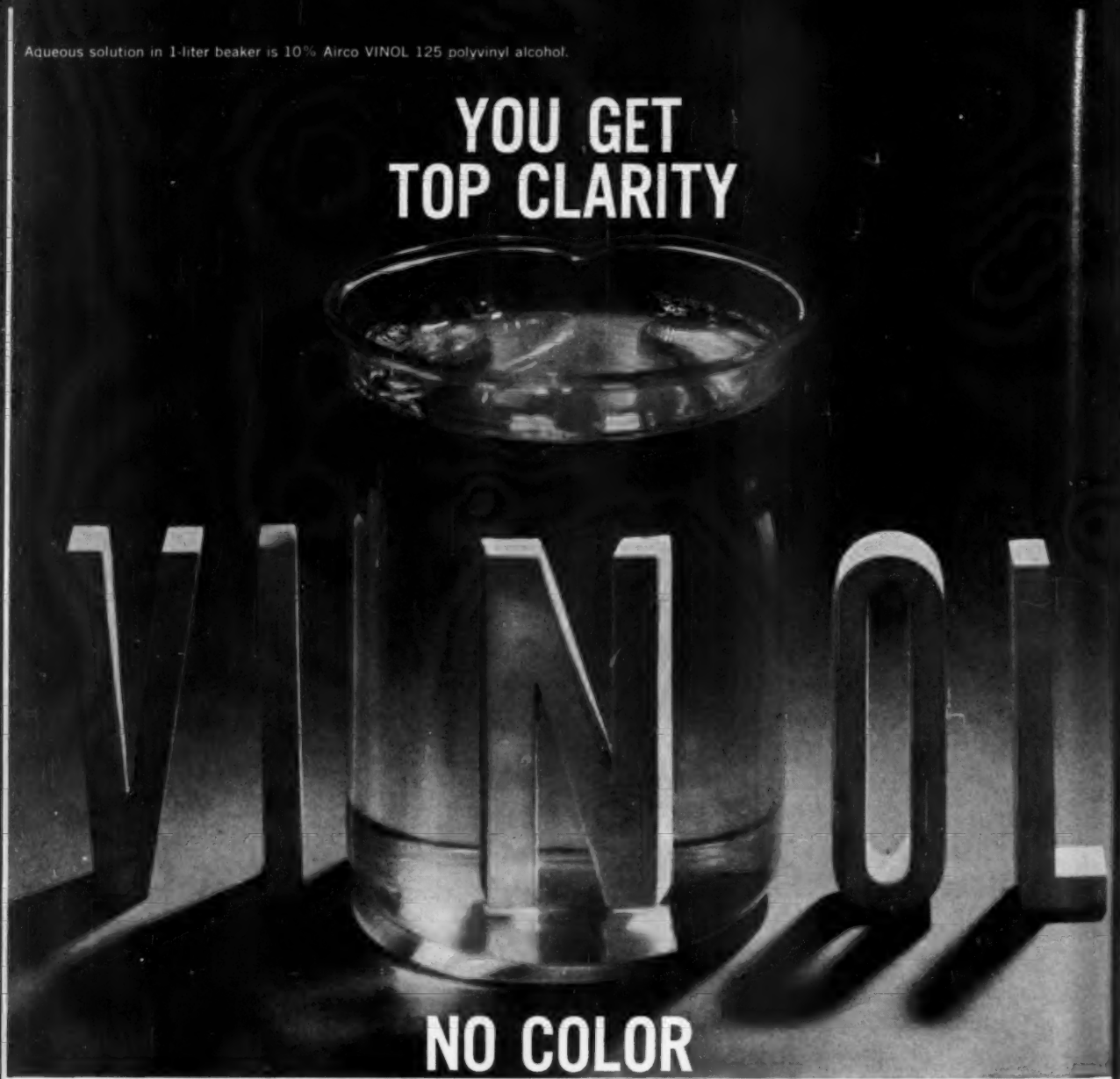


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# capitol cues

CONGRESS WILL PASS A LOT MORE OF KENNEDY'S PROGRAM than first reports have indicated. The opening months of the session...as is the case with any new Congress...have been devoted to organizing and hearings. Besides, the new White House team has needed time to draft its policies. But now things are beginning to move. There'll be opposition from the expanded Republican contingent, plus some Democrats. But Kennedy now has a majority on the Rules Committee and a powerful prod to Congressmen in the form of job patronage.

The most the opposition seems likely to do is water down some of Kennedy's proposals. It may delay action a bit or trim the amount of money involved. In the end, the programs will pass. Many of them will add to industry's costs, one way or another.

Here is the latest appraisal of these programs' chances:
-Higher minimum wage--Congress will lift it to $1.25 hourly but won't extend coverage to all the workers Kennedy wants.
-Medical care for the aged--Financing with Social Security... partly at the employers' expense...is meeting such strong opposition that its backers may put off a vote until 1962.
-Depressed areas--Kennedy is getting the bulk of his request.
-Aid to education--Money seems certain for classroom building and scholarships, but not for financing teacher's salaries.

APRIL'S BUSINESS STATISTICS WILL MAKE BETTER READING, say economists in government and industry--a reassuring note that may help offset current bad news. April is when the experts think the downturn will come to an end. The stepped-up rate of federal spending will make itself felt this Spring. Spurred by Easter and better weather, people will start buying more, too.

Specifically, here's what the economists will be watching:
-Auto sales--Will there be a seasonal pick-up this Spring?
-Home building--Will reducing mortgage rates spur activity?
-Inventories--Will industry and consumers be needing goods so that they will have to start reordering at higher rates?
-Employment--Will there be a significant pick-up in jobs?

The economists are convinced that all these indicators will look better when the April figures are in. They concede that the subsequent recovery may be slow and fairly extended.

KENNEDY'S PLANS FOR HALTING THE RECESSION are disappointing some of his liberal supporters. They also agree business will bottom out in April. But they feel that Kennedy should be asking for more spending and a tax cut. Their big worry is that the coming recovery in business won't be fast enough to start the economy growing at the rate that they believe is now necessary. Without additional pushing, they see the economy limping along on a plateau.

One of the important developments of Kennedy's first weeks in office--as far as business is concerned--is the conservative tone of his policies. He will still push spending programs and a bigger role for the government. But he'll move slowly ...waiting till economic growth generates necessary revenues.

## capitol cues (cont'd)

PROFITS OF CORPORATIONS WILL ALSO TURN UP this quarter--or the next. Rising costs and intense competition have been pinching earnings for a year. But once the turn in business comes, rising output will lift productivity. The profits increase will be slow. You won't see any new record this year. This prospect helps explain why stock prices began to rise a while back.

THE KENNEDY ADMINISTRATION WILL STEP INTO BIG STRIKES that threaten to hurt the economy. That's the meaning of its role in the N.Y. tug strike and the later walkout of flight engineers on the nation's leading airlines. The new policy is to intervene before strikes reach the full disaster stage. Kennedy's prestige will be laid on the line in efforts to shorten stoppages.

LABOR SECRETARY GOLDBERG IS BECOMING A KEY MAN in Kennedy's Cabinet. This would be very unusual. The Labor head has never been powerful before. But Arthur Goldberg has caught Kennedy's eye for several important reasons. Goldberg settled the tug strike. He made a well-publicized tour of areas of heavy unemployment. And he has led the fight for key Kennedy bills. These include the depressed area, minimum wage, and jobless benefit bills.

> Kennedy considers Goldberg a "ball of fire" and admires his intellectual bent. The President has also been impressed by Goldberg's readiness to assume positions contrary to those held by his ex-employers at the AFL-CIO. Example: Goldberg opposes, for now, the unions' goal of a shorter workweek.

LABOR'S PLANS TO ORGANIZE WHITE-COLLAR WORKERS should not be taken lightly. AFL-CIO leaders are deeply disturbed by current trends in union membership. Their numbers aren't keeping up with the labor force's growth. Even more upsetting to them is the fact that, in many cases, membership is down absolutely. Meanwhile, the Teamsters, outside the AFL-CIO, have grown.

> The labor chiefs fully appreciate the fact that white-collar employees now outnumber industry's production workers. So, clearly, the white collars are the best hope for recruits. Dynamic Walter Reuther will lead the drive, with new powers.

THE COSTS OF MEDICAL CARE WILL SPURT QUITE SHARPLY this year--maybe by 4% or 5%. The steady pace of late years will quicken. Almost all items will rise. This is going to mean an increase in costs for many companies. Higher charges for care will mean upward revision in "fringe" benefit costs.

> Here's the outlook for specific medical care items:
> -Hospital insurance will climb 7½%, as more people claim it.
> -Hospital rates will rise 7%, with wages and bed shortages.
> -Doctors' fees will go up 2-3%...a bit less than in 1956-59.
> -Prescription costs will hold steady after recent sliding.
>
> Medical care costs will keep rising for years, if Kennedy's program for the aged is enacted. Giving the old folks new benefits would tax facilities and push costs up generally.

"HOW TO KEEP IN TOUCH WITH U.S. GOVERNMENT PUBLICATIONS," a booklet available from the Government Printing Office (Washington 25, D.C.), is a guide to the many hundreds of useful items put out each year. It is free.

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• **Promoting International Trade.** The Trade Missions Program spearheads the international trade promotion activities of the U.S. Department of Commerce. The Missions are composed of businessmen and representatives of the government, working together in a team to develop increased commerce between the United States and all other countries. By person-to-person contacts and meetings with foreign businessmen and Government officials, opportunities are explored for the exchange of import-export trade, investments, joint ventures, licensing and other business relations. Many specific trade and investment proposals presented to the Mission members are recorded and in turn made known to the American business community.

Between 1954 and the end of December, 1960, 87 Missions traveled to 53 countries and visited over 650 cities in the interest of extending our commercial relations and trade, and coincidentally showing our private enterprise system in action. Trade Missions consist of three to five businessmen with recognized ability and specialized experience in modern business practice. Each Mission is led by an official of the Department of Commerce. Businessmen volunteer and work without compensation, the Government providing transportation and a daily expense allowance. The latter is more than sufficient to cover all expenses, particularly in countries with lower price levels. Thus far 228 businessmen have served on Trade Missions, usually for a tour of six to nine weeks abroad. A Mission's overseas schedule may include an international trade fair where the U.S. Government and private firms participate. Where a fair is included in the Mission's itinerary, a Trade Information Center is established in the U.S. exhibit. Here the Mission holds additional personal conferences with foreign businessmen to answer trade inquiries and receive business proposals.

American business organizations, companies and individuals are invited to participate in this program by nominating top executives and business leaders qualified for this service. Nominations should be sent to Trade Missions Division, Office of Trade Promotion, Bureau of Foreign Commerce, Washington 25, D.C., which will supply more detailed information on this program and the terms of service.

• **Casting and Impregnating Resins in the Electrical Industry.** In the electrical industry, cast epoxy resin insulation has led to the introduction of new concepts of design. Casting of epoxy resins as *Adhesives & Resins*, a British publication, points out in one of its recent editions, is normally carried out by simple gravity techniques. The epoxy resin-hardener mixture in a liquid state is poured into molds of metal or plastic or other suitable material and cured. Although the term "casting" is used to describe the general process, it usually implies the production of a component where the mechanical, as well as the electrical insulation properties are prominent. Potting, or encapsulation implies the complete embedment of an electrical component in a protective mass of resin, which not only insulates but also protects the article against vibration, shock, chemical attack and prevents ingress of dust and moisture, etc. Simple techniques as well as inexpensive tools and molds enable insulators, supports and composite structures to be made quickly and accurately with substantial reductions in weight, size and cost—and with elegant simplification of design.

• **Bonding Structural Joints.** A new adhesive especially developed for structural applications, is said to combine exceptional strength with unusual resilience and a high degree of physical stability, according to the *Financial Times*, London. Tests are said to have shown, for example, that it can be used to reinforce rail joints so that they remain tightly closed under horizontal loads well above 250,000 pounds per square inch. It can be cured overnight without the use of heat or in half an hour at a temperature of 300°F. The bond formed develops sheer strengths of up to 4960 pounds per square inch. The adhesive, which is expected to find application in a large number of industrial fields, is said to have good resistance to weathering and chemical attack, and to be unaffected by climatic extremes.

• **Bonding Surfacing Materials.** With the development of newer types of decorative surfacing materials, based mainly on synthetic resins, such as Formica, Warcerite and similar products, a demand has arisen for a powerful adhesive with a good degree of heat resistance. These requirements are met by the properties of neoprene adhesives. A solvent-based adhesive modified by the addition of tackifying resins is applied to both surfaces to be joined, allowed to dry completely and then pressed together. Self-adhesive tack enables a strong bond to be made. This technique is widely applied in the furniture trade and repair shops where these laminates are used for the working surfaces of counters and tables.

# ADHESIVES GUIDE

by JOYCE HURD

## • A Practical Handbook

designed to serve as a guide to the types of adhesives available for bonding various materials in various applications. This new British publication covers adhesives used in woodworking, bookbinding, footwear, etc., and offers valuable data on the advantages of adhesive bonding and the classification of adhesives.

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Encyclopedia of Basic Adhesive Types.

Classification of Manufacturers (British) by Basic Types of Adhesives Made

Catalog of Adhesive Manufacturers and Their Products

Trade Name Index (British)

Miscellaneous Adhesive Recipes

British Organizations Concerned With Adhesives

Bibliography

With contents including data on something like 400 individual adhesives made by about 100 different manufacturers, this publication will prove to be a valuable edition to your technical library. More than 50 main types of adhesives and their properties are covered.

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# Adhesive Clips Facilitate Telephone Wire Installation

**Researchers at the Bell Telephone Laboratories have developed two types of adhesive clips for attaching wire to various kinds of architectural materials**

By D. K. RIDER
Bell Telephone Laboratories, Inc.
Murray Hill, N.J.

The Bell System telephone installer frequently encounters situations requiring the installation of extensive runs of station wire between the protectors and the connecting blocks for telephone set cords. These runs must be made over marble tile, cinder blocks, concrete, plaster, wallboard, steel casements, porcelanized steel, wood, and other materials common to building construction. The simplest installation consists of driving staples into wood trim to anchor wire in place. Other architectural materials have often provided some rather imposing installation problems.

### *Mechanical Fasteners*

Figure 1 illustrates some of the types of fasteners required to attach station wire to a variety of surfaces. Ordinary drills can be used to produce screw holes in metal sheathing or casements for the attachment of station wiring clamps or cleats, but as any mechanic or do-it-yourself fan knows, a drill will often skid out of position and mar such a surface. Marble tile tends to crack readily when drilled. Ordinary drill tips are virtually useless on masonry. Even carbide-tipped drills have proven to have a short service life when certain aggregates are encountered.

It was this sort of situation which prompted the Bell Laboratories Apparatus Development Engineer, who is responsible for the design of such hardware, to seek adhesive means for installing station wire. The Adhesives Group of the Chemical Research Department was requested to consider various possible solutions to the problem.

The wire insulation itself could be coated with an adhesive, but the cylindrical form of the wire would provide a narrow and unstable bonding surface. In addition, it might become necessary for the installer to carry two codes of station wire—one for stapling to wood and one for bonding to other surfaces. Furthermore, there would be many problems in handling an adhesive-coated wire, and unless the entire insulating jacket were coated, it would prove difficult to run the wires around corners and maintain adhesive contact with the mounting surface.

The next thought was that an extruded plastic trough could be bonded to the wall and the wire then be snapped into the groove. Even by using discontinuous, short lengths of plastic trough, however, this approach appeared to be too costly. The use of formed, adhesive coated metal clips was then considered (See Figure 2). It was concluded that these could be fabricated economically by conventional metal stamping techniques from coils of painted and adhesive-coated metal sheet.

The next question was what specific requirements would have to be met. Since conventional station wire staples driven into white pine pull out under a load of about fifteen pounds, it was felt that this should be the design goal to shoot at. As for the time allowable for setting of the adhesive, it was reasoned that a typical installation might require 15 minutes. On this basis, the bond should develop a fifteen pound pull in this time so that the installer, after placing all the clips, can clinch the tabs over the wire 15 minutes after starting his run.

### *Bending Clip Tabs*

The bending of the clip tabs can be the critical operation as far as the bond strength is concerned. If an installer becomes careless at this point, he may neglect to press the clip firmly against the mounting surface while he bends the tabs. If the bond is not set adequately, the bending of the tabs may pry the clip off the surface.

In addition to these requirements,

**About the Author . . .**

DON K. RIDER is in charge of Resins and Laminates Development at Bell Telephone Laboratories. In 1957, he was chairman of the Gordon Research Conference on Adhesion.

# Installation Time Comparison for Two Adhesive Clip Types

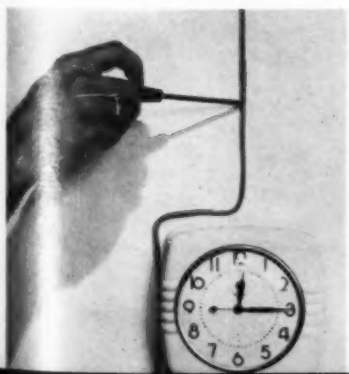
Solvent cleaning of mounting surface is the first step in using both solvent-activated (photo column on left) and heat-activated adhesives (photos on right).

Clip is activated with an applicator saturated with trichloroethylene. A few seconds are allowed for proper tack to develop.

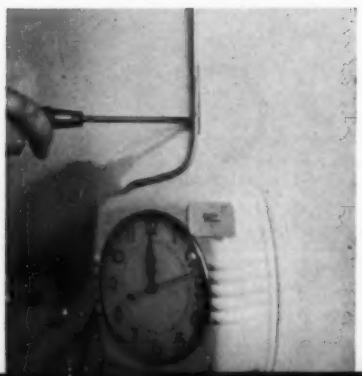
Mounting clip on the heated iron. Tool's soldering iron tip is designed to produce temperatures of from 350° to 375°F.

Clip is pressed to the mounting surface for about five seconds. A sponge pad bonded to a wooden pressure block can be used.

Heated clip is applied to the solvent-cleaned surface. Bond attained on cooling exceeds that of solvent-activated clip's full strength.



Clinching tabs over wire. Actually, worker would use other hand to steady the clip. This is not done here for sake of photo clarity.



Clinching tabs over wire. As with other system, clip should really be steadied with hand. Note the different times.

the adhesive is expected to have a minimum shelf life of six months after date of manufacture and a service life of many years. Service will be indoors, but may involve limited exposure to sunlight, water, high humidity, elevated temperatures (around radiators), low temperatures (in unheated buildings), and cleaning solutions. The clips must also withstand a reasonable amount of physical abuse from the housewife's mop or vacuum cleaner, and from occasional tugs by small fry.

From the standpoint of the installation, the clips must adhere to all conventional materials of construction. The bonding must be accomplished rapidly, with simple tools, and must not require specialized skills. In addition, of course, is the ever-present requirement of low cost—both in materials and labor.

### *Various Adhesive Forms*

Needless to say, there are several physical forms of adhesives which might be employed. Tacky adhesives were considered but discarded on the basis of their relatively low strength particularly at elevated temperatures, their poor resistance to creep, their poor bonding to cold surfaces, and their questionable service life in the required environments. Bulk adhesives, i.e., dispersions or solutions packaged in cans, tubes, bottles, etc., were not given serious consideration because of their messiness and lack of uniformity when applied under field conditions.

The ideal solution appeared to be dry film adhesives applied to the clip in the factory under controlled conditions. Heat activation of such adhesives was deemed impractical since torches would create a fire hazard, and electric power might not be readily accessible. It was thought undesirable to depend upon power sources available on the premises.

The alternative to heat activation was activation by solvents. The solvent must, however, be non-flammable, non-toxic, must not lift paints, or corrode metals, etc., and must be sufficiently low boiling to produce a rapid "set".

The adhesive must also provide sufficient "bulk" to conform readily to rough plaster, cinder block, concrete, and wavy surfaces. Heavy coatings of liquid adhesive would pose problems in manufacture due to slow solvent release. Thin coatings would provide poor contact to non-planar surfaces. Adhesive-impregnated papers or woven fabrics would also have relatively little bulk, while coated backings might tend to delaminate.

It was felt that non-woven (bonded) fabrics would provide sufficient bulk to give good conformability at low pressures. Properly impregnated, they would ensure a continuity of binder from the clip surface to the mounting surface. Fibers running through the thickness of the fabric web would also serve to reinforce the strength of the bond.

As a result of extensive laboratory tests, the best adhesive system for these clips appeared to be a single ply, 0.020-inch thick web of bonded fabric impregnated with a phenolic-modified neoprene rubber cement. This adhesive is readily activated with trichloroethylene solvent which is non-flammable and non-toxic in the small volumes required. Table I shows typical data obtained on experimental clips activated with various solvents. The other adhesive requirements are also met quite readily with this material.

### *Supported Film Adhesive*

The metal clip is fabricated from 0.020-inch 5052-1/4H aluminum alloy, roller coated with an appropriate enamel. The supported film adhesive is continuously laminated to the painted aluminum strip by solvent activation. The clips are then stamped out and the tabs

**Figure 1—A selection of mechanical fasteners used for telephone station wire. Runs of wire have to be made over tile, cinder blocks, plaster, wood and steel.**

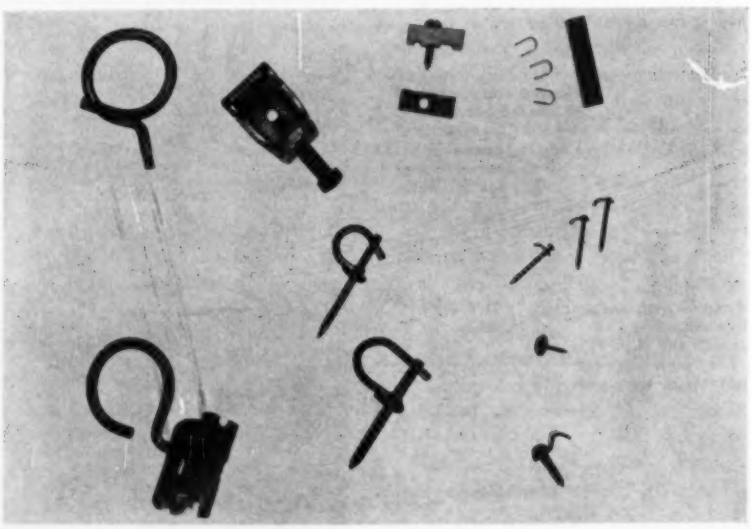
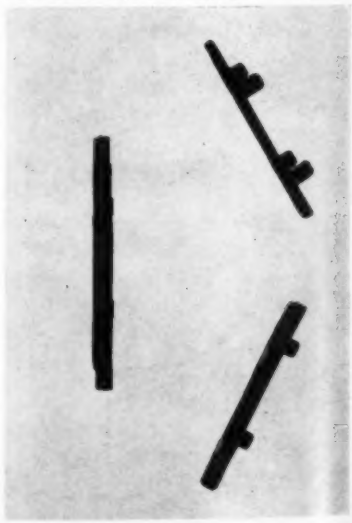


**Figure 2—Station wire adhesive clips now used by Bell System installers.**



formed to an angle normal to the bonding surface. They are then packaged in small cartons stamped with a legend, "For best results use before ——" (date 6 months after manufacture).

### *Tailored Dimensions*

The dimensions of the clip are tailored to the particular adhesive used and to the bond requirements. This clip (shown in Figure 2) is narrow enough to be concealed behind the station wire and long enough to develop the required pull-off strength in the 15 minutes time allowed. The metal thickness and the tab dimensions are such that the clinched tabs will open up with a pull of approximately 25 pounds, without pulling the fully set adhesive off the mounting surface.

During installation, the adhesive surface is swabbed with an applicator saturated with trichloroethylene. After a delay of a few seconds (to allow the solvent to penetrate and tackify the adhesive), the clip is pressed against the clean mounting surface for about five seconds using the fingers or a sponge rubber pad bonded to a wooden pressure block. No less than 15 minutes after applying the clips, the wire is installed and the tabs are clinched with a screwdriver or other tool, while holding the wire and clip firmly against the mounting surface.

### *Weakness in Cleavage*

Where subsequent removal of a clip is necessary, removal can be effected quite readily by taking advantage of the inherent weakness of an adhesive in cleavage, and simply prying the clip off the surface. An insoluble residue of adhesive will normally be left on the mounting surface, but this is certainly less objectionable than the physical damage which would result from the use of mechanical fasteners.

Approximately five years' service experience with the station wire adhesive clip has brought to light some shortcomings of this item. One of the most serious has been the limited shelf life of these clips

**Table I—Solvent Activation of Experimental Neoprene Adhesive Clips**

| *Solvent* | *Ratio* | *Assembly Time, Sec.** | *Nominal Pull-Off Strength†* | *Film Condition After 15 Min. Set Time* |
|---|---|---|---|---|
| TCE‡ | — | 3-7 | 14.5 | Sl. tacky |
| TCE‡/xylene | 9/1 | 5-10 | 13.0 | Sl. spongy, tacky |
| Xylene | — | 30 | 12.0 | Moist |
| TCE‡/toluene | 4/1 | 10-15 | 11.0 | Spongy, dry |
| Toluene | — | 15-20 | 11.0 | Spongy, sl. tacky |
| MEK‡ | — | 5-10 | 9.5 | Dry |

Notes: *Time between solvent activation and application of bonding pressure for specimens tested. Measure of time required to develop maximum tack. †Tested after 15-minute set time on aged plaster mounting surface. Failures frequently occurred within plaster base at pull-offs between 12 and 18 pounds. These values were disregarded. ‡TCE (trichloroethylene); MEK (methyl ethyl ketone).

**Table II—Typical Test Data on Experimental Heat-Activated Clips**

| *Adhesive* | *Substrate* | | |
|---|---|---|---|
| | *Porcelain Enamel on Steel* | *Air Dried Lacquer on Wood* | *Air Dried Enamel on Aluminum* |
| **Neoprene-Phenolic** | | | |
| Unsupported coating..... | 53 (28) 3 | 28 (17) 2 | 47 (27) 2 |
| Supported film ..... | 39 (23) 2 | —— | —— |
| **Nitrile-Phenolic** | | | |
| Unsupported coating..... | 75 (57) 4 | 44 (33) 4 | 94 (64) 4 |
| Supported film .....109 (98) 1 | | 111 (89) 1 | 90 (75) 1 |

Note: Clips are heated eight seconds at 350°F. (iron temperature). The figures given under each substrate in the above table represent the following: average pull-off strength—(average of minimum single values)—number of adhesives evaluated.

**Figure 3—Effect of Temperature on Adhesive Shelf Life**

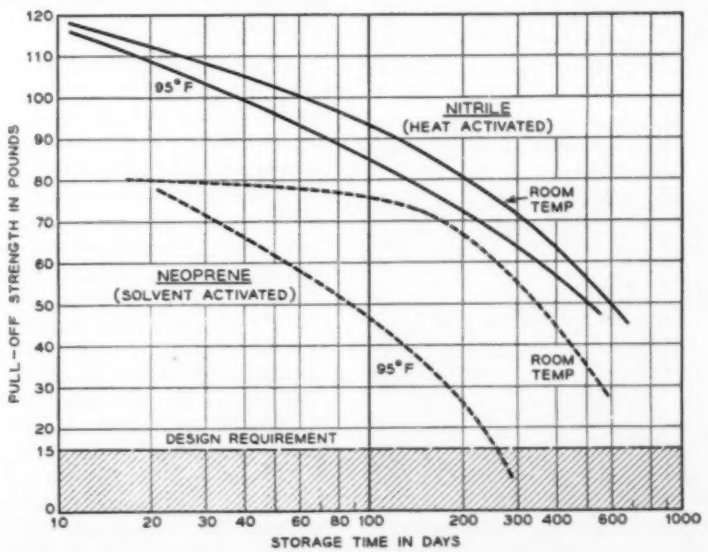
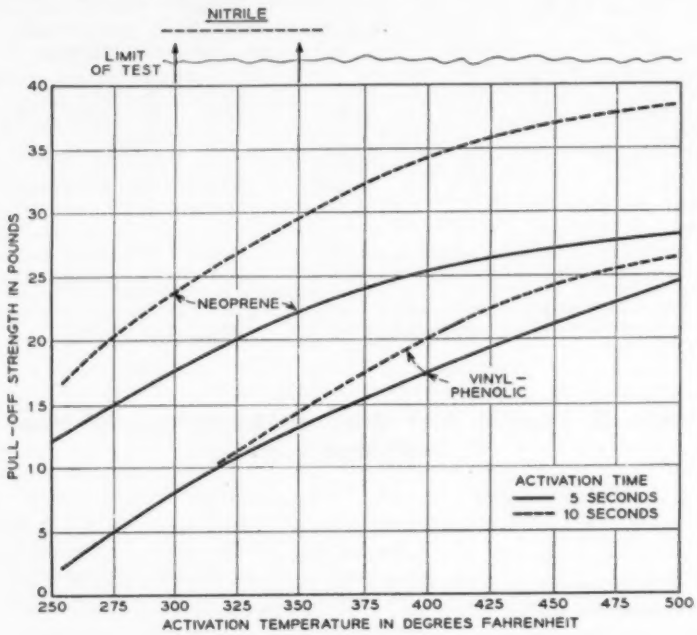


**Figure 4—Effect of activation Time and Temperature on Different Supported Film Adhesives**




in the hot summer months. The manufacturer of the clips can effect manufacturing economies by making a year's supply in one continuous production run, but due to the limited shelf life, and the problems of distribution, it becomes necessary to manufacture the product in discrete, short runs. In the field, occasional accidents have occurred in which tins of the activating solvent have been spilled, causing some inconvenience to the subscriber as well as to the installer. Also, the set time of the solvent-activated adhesive is so long as to slow down the installer to some extent.

***Meeting Shortcomings***

Work has been carried out in the Adhesives Group which indicates that these shortcomings could be overcome by the use of heat-activated acrylonitrile rubber-phenolic resin type adhesives with heat in the order of 350° to 375°F. For the sake of providing the laboratory technician with an available device for investigating heat-activated adhesive systems for other uses, it was found expedient to apply the adhesive to the same type of metal clip currently in use for station wire installation. This permitted employment of the same test fixtures and provided a base for strength comparison with a known adhesive system.

The heat activation technique calls for pressing the item to be bonded against the mounting surface for approximately eight to ten seconds using an electrically-heated tool. This tool consists of a special soldering iron tip so designed as to produce a surface temperature of 350° to 375°F. when the iron is plugged directly into a standard convenience outlet. Within the period of application, thermocouple measurements have shown that the mounting surface will attain a temperature of about 240° to 300°F. for no more than a second before the heat is removed. On removal of the tool and cooling to room temperature, the bond immediately attains a strength exceeding the fully developed strength of the solvent-activated adhesive system.

The sequence of steps involved in the use of solvent-activated and heat-activated adhesives is illustrated on page 20. For the sake of convenience, the same clip form is used for both adhesive types. The advantages of the heat activation technique are quite apparent. In addition, the heat-activated adhesive would have a shelf life in excess of that of the solvent-activated material, especially at summer temperatures (see Figure 3). This should permit manufacturing economies and simplification of distribution of items.

Using this same basic approach of heat activation, it might prove possible to employ other polymers as the bonding agents, with still further economies in manufacture and storage stability. Figure 4 shows preliminary data obtained on three different types of heat-activated adhesives.

Although the heat activation technique is not presently acceptable for use on the premises of telephone subscribers, this principle of bonding has considerable merit for a number of uses and is currently being employed in the manufacture of some telephone apparatus.

The station wire adhesive clip is only one of many forms in which adhesives perform an indirect service to the telephone subscriber. Adhesives are also used in the assembly of many components of the telephone plant, station apparatus, pay stations, as well as test sets and tools. Without adhesives, Bell System designers would be hard put to design many telephone items in an economical and functional manner.


## Acknowledgments

The author wishes to recognize the invaluable contributions made in the development of the station wire adhesive clips by Messrs. F. A. Keimel and D. J. Maccia. The author also wishes to acknowledge the cooperation of Mr. L. W. Giellerup of Girder Process, Inc., in providing special samples for this development program.

# Adhesive Bonding Speeds Production at Smith-Corona

In line with industry's expanding use of adhesive bonding to cut labor and material costs, Smith-Corona Typewriter, division of Smith-Corona Marchant, Inc., Groton, N.Y., has found four uses for an adhesive in assembling its new "Galaxy" portable typewriter.

When the Smith-Corona Management planned the introduction of the new top-line model, the engineering department investigated the practicability of replacing conventional assembly operations (which involve drilling, tapping, bolting, screwing, crimping, swaging, etc.) with a quick, foolproof adhesive bonding method.

The adhesive chosen for the job was Eastman 910 Adhesive, supplied by Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Company. Tests showed that the formulation could produce high-strength bonds with little or no contact pressure and without the time lag usually needed for curing or solvent evaporation.

In all, five different types of bonds are made in the four production line applications: vinyl to acrylic, butyrate to acrylic, vinyl to melamine-coated aluminum, vinyl to steel, and anodized aluminum to enameled aluminum.

In the first application, an acrylic molding key mask receives two vinyl cleats which serve to hook it to the outer metal frame of the typewriter. Only one drop of adhesive is needed for each of the cleats which are clamped into position for eight minutes to assure proper set. Later, the mask with the attached cleats is added to the machine during final assembly, and so strong is the bond that the cleats remain under slight tension permanently thereafter.

Bonding the Smith-Corona monogram (made of Tenite butyrate plastic) to the acrylic key lever mask is the second application. Only a drop of adhesive is required. Here, the setting reaction is triggered merely by momentary pressure of the fingers. Formerly, this operation consisted of drilling holes in the mask and then securing the monogram mechanically.

For the third application, the adhesive is used to bond tiny vinyl retainers to the paper bail, which fits across the top of the machine to promote straight paper feeding during typing. These retainers hold a steel shaft which, in turn, carries small rubber rollers that press the paper tightly against the rubber platen. The paper bail itself is a long, narrow half-cylinder of extruded aluminum sprayed with a melamine coating.

On the assembly line, a drop of adhesive is placed on two areas of the bail and the vinyl retainers are set in place with the aid of tweezers, while momentary pressure is applied via a screwdriver. The rubber rollers are then set in position between the retainers, and the metal shaft is run through both rollers and retainers. To anchor the shaft permanently in place, a drop of adhesive is placed on one end of the shaft which is then shifted just enough to bring the adhesive into contact with the retainer.

In the final application, an anodized aluminum name plate is bonded to a recessed location in the enameled top deck of the typewriter. Here, six drops of adhesive are spread over the recess and the name plate placed in position with only slight pressure of the fingers.

**Six vinyl retainers used to control the paper are permanently bonded to a melamine-coated aluminum paper bail.**

**Only a drop of adhesive is used to bond vinyl cleats to the molded acrylic key lever mask of the Smith-Corona Galaxy.**

**An anodized aluminum name plate is bonded to the enameled aluminum top deck with several drops of adhesive.**

By CHARLES F. DONOVAN
Project Engineer
B. B. Chemical Company
Cambridge, Mass.

# Production Line Bonding of Fabric-Covered Paint Rollers

The basic concept of putting paint on a surface by means of rotating, fabric-covered cylinders is certainly a simple one, yet the development is comparatively recent. According to some manufacturers, it may very well be that the development of paint rollers was held up by a lack of an effective and suitable adhesive for bonding the cover of the roller to its core.

The bond for this application not only has to resist water and strong solvents, but also be unaffected by a variety of paints such as latex and oil types. In addition, it must be workable in production where a minimum of curing time is allowed.

Two paint roller manufacturers, both located in Ohio, trace the successful development of their products to the qualities of the adhesives they use to bond cover to core. They are Deshler Products, Inc., in Deshler, and the Buckeye Division of Mardigian Corp., in Wooster.

At Deshler, paint rollers are made with five different types of fabrics and with three different roller frames, and there is continuing research conducted to find the best adhesives for bonding the roller covers to both vinyl and fiber cores or tubes.

### *Torture Tests*

The vinyl cores are used for the so-called professional-grade rollers. Deshler covers these cores with neoprene-backed fabrics. In torture tests devised by the company's research department, it was found that the one adhesive able to provide the quality bonding desired for such rollers was a polyurethane formulation, Bostik 7070, made by the B. B. Chemical Company, Cambridge, Mass.

The production of the vinyl core paint rollers at Deshler involves the following series of operations. On a roller coating machine, the vinyl tube is set in place just above a rotating mandrel which picks up adhesive from a trough below and spreads it evenly on the tube. An operator then applies the fabric coating to the tube in a bias pattern as the tube continues to rotate. A foot pedal provides the operator with necessary control of mandrel positioning.

Now the tube—which is 45 inches long—moves along to the pressure station. Here another rotating mandrel presses the fabric to the tube under controlled pressure conditions. From here, the tubes are brought to a storage area and set upright for proper curing.

After curing, the tubes are cut to proper lengths which are transported to an automatic beveling operation by a conveyor belt. Visual inspection is conducted on a 100 per cent basis.

At Mardigian, all rollers are made with phenolic-impregnated fiber tubes as cores. These, too, are covered with neoprene-backed fabrics. The bonding of cover to core is done with an adhesive designated as Bostik 4034, a formulation found to have high resistance to solvents and water.

Here is how the rollers are produced at Mardigian. The fiber tubes receive an even application of the adhesive over their entire surfaces. This is accomplished by means of a rotating mandrel around which the tube is placed. A cylinder positioned above the mandrel drops beads of adhesive onto the tube. The pattern of holes in the cylinder makes it possible for the adhesive to thoroughly cover the tube.

In the next operation, the fabric is wound around the tube. Immediate tacking ensues because of the special qualities of the adhesive. Final bonding of fabric and tube takes place in a specially designed air pressure chamber. After a short storage period for final curing, the 21-inch tubes are cut into three seven-inch lengths or into two nine-inch lengths and one three-inch length.

**About the Author . . .**

CHARLES F. DONOVAN has been with B. B. Chemical Co. for the past two years. Prior to that he was associated with the Interchemical Corp. for eight years.

In the photograph on the far left, a workman pours adhesive into trough of machine for coating roller cores at Deshler Products, Inc. The adhesive is applied to core by a rotating mandrel.

The adhesive-coated roller is covered with fabric, photograph on left, in the next production step at Deshler. Notice that fabric is applied on the bias. Only hand pressure is required.

Operator pushes button to begin rotation of pressure mandrel against the fabric-covered vinyl tube, which is 45 inches long. This is the controlled pressure station which completes the bond. Deshler uses five different types of fabrics and three kinds of roller frames. The company carries on its own research to improve bonding techniques used.

Storage area at Deshler Products where fabric-covered roller cores are kept for proper aging of the adhesive bond. Specimens are torture-tested for quality control.

In this operation, fully-cured roller cores are cut into predetermined lengths. From here, core sections are then carried by conveyor belt to a beveling operation.

By MURRAY McDOUGAL
President and General Manager
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# Producing Pressure-Sensitive Labels

**An expert surveys the current methods for producing the various types of adhesive paper stock used in making pressure-sensitive labels for different applications**

Twenty-five years ago, a new era in the labeling field began with the introduction of what has since become known as self-adhesive or pressure-sensitive labels. The first ones were plain, unprinted labels sold chiefly for price marking purposes. Today, pressure-sensitive labels are being used for everything from car license tags to electronic circuit guides.

What began in a small way in home workshops and upstairs rooms has mushroomed into a multi-million dollar industry. And the relatively primitive manufacturing methods used in the early days have since evolved into highly precise, specialized systems.

In manufacturing pressure-sensitive labels, the adhesive-coated stock is generally produced by a separate company, such as Presto, and supplied to the label manufacturer. Labels are then printed and die cut. If the labels are to be used for marking purposes, special machines of several types are available for imprinting them at a later date.

**About the Author . . .**

MURRAY MCDOUGAL has been associated with the pressure-sensitive label industry since 1937. A graduate of the University of California, he now heads Presto.

The first step in adhesive-coated paper manufacture starts with the paper as it comes into the plant in large mill rolls. Rolls are weighed in to check the weight, then put on a slitting machine to produce rolls of the width desired. Later the paper roll can be reweighed to determine how much was used. The paper itself is made to specification.

Special characteristics determined by the end use are built in at the mill. Then a "tie-coat" is applied on the back to provide a secure bond for the adhesive and prevent it from migrating into the paper and causing discoloration. In addition to regular label papers are the many special papers now in use, such as gold, silver and copper foils, Mylar, vinyl, transparent films, and rubber-impregnated papers.

In the next production step, the paper rolls are mounted on a coating and laminating machine, and wet adhesive applied in a controlled thickness measured in 10/1000ths of an inch.

Adhesive is either applied to the entire surface or in narrow strips, the width of each depending upon the label manufacturer's specifications. The width and thickness of the gum pattern is controlled by an especially milled metal insert, located in the adhesive fount.

An adhesive is selected for a particular job on the basis of its ability to combine with the paper and provide the right degree of "stickability." In certain cases such as brand identification and instructions, non-removability may be desirable. Here the adhesive chosen must be removable from the label's glassine backing, but permanent when placed on the product. Other cases call for varying degrees of removability.

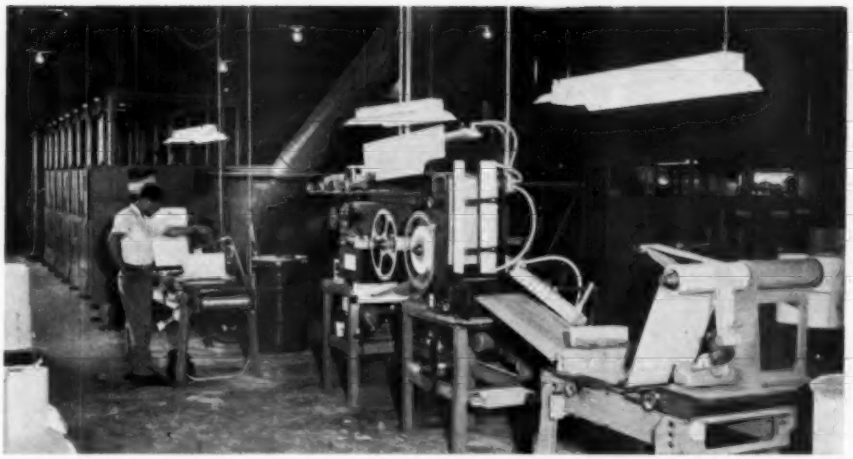
Normally about four adhesives are used, depending upon the need. However, at Presto when a special adhesive is required, more than 500 formulations are available.

After adhesive-coating, the paper enters a drying tunnel. Temperature in the dryer is kept 60 degrees higher than room temperature. After four passes through the dryer the paper emerges with the gum film perfectly dried. The gummed paper web then enters a laminating machine, where a protective backing, usually of glassine, is applied.

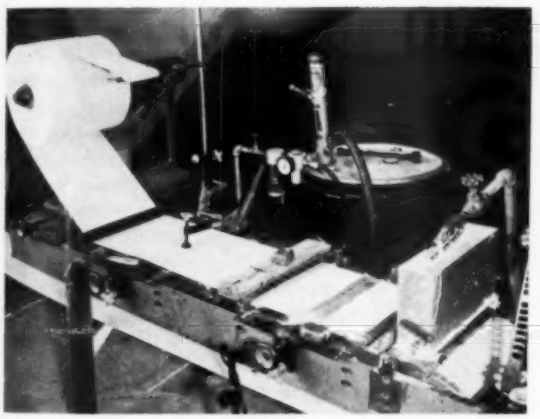
Both adhesive-backed paper and the glassine are kept in perfect register by two sensing devices called web control guides. Any tendency of the paper webs to get out of register is instantly corrected automatically so that precise alignment is maintained throughout the run.

While various factors of paper and adhesive influence speed, the coater at Presto will gum and laminate at 250 feet a minute. Only one man is needed to operate it. This equipment is based on Presto's own design and has resulted from long experience in the industry.

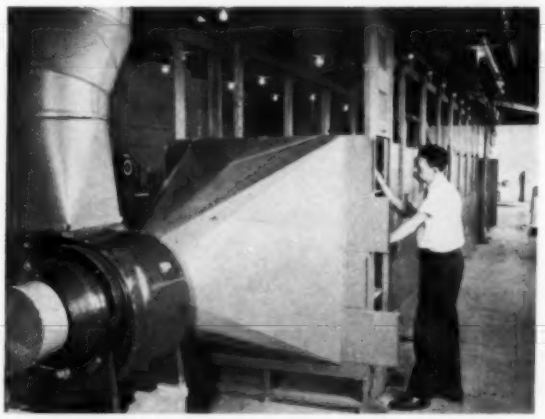
A continuing quality control pro-



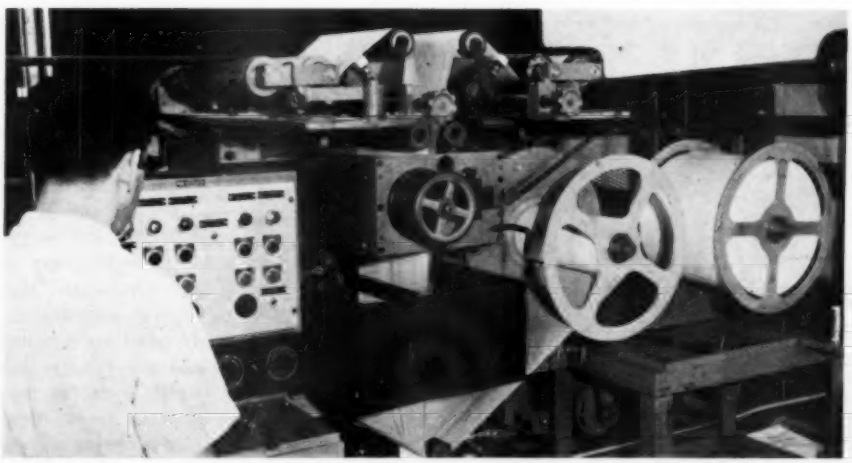
Over-all view of continuous operation at Presto shows paper being coated and carried into the drying tunnel, left, and then going on to be laminated with a glassine backing paper, right.



Close-up shows adhesive being applied to surface in narrow strips. Milled metal insert at fount controls their width.



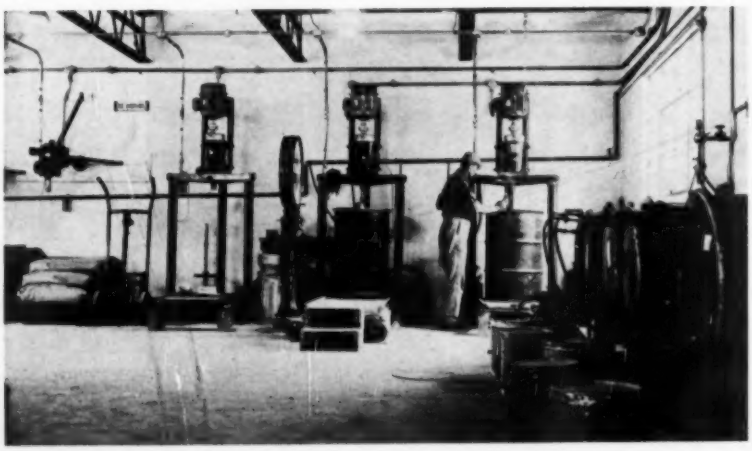
The drying tunnel shown here is two hundred feet long. Heat in it is maintained at 60 degrees above room temperature.



All production line controls are located on the console shown here. At this point the coated paper web has been dried and is being laminated with the glassine which serves as a backing.

Mill patches are removed on this special inspection machine and clean splices are put in. This operation also guards against variations in strip patterns.

On production line at Presto Adhesive Paper, a coated sample is carefully "miked" to insure that the adhesive coat remains within close specifications of the client.



Adhesives are mixed to specification in this area of the plant. Four general types are used, but the company makes over 500 formulations available to its clients.

gram is carried out. Samples are taken from the web periodically and gaged with a micrometer to insure that the adhesive coat remains within specifications.

Every laminated roll is inspected on a specially built high-speed inspection machine. Here mill patches in the web are removed and clean splices put in so that the label manufacturer can run the paper through his presses without stopping to remove rough patches. Inspection also insures that there are no missing gum spots or variations in adhesive strip patterns. The customer gets a good, clean totally usable roll.

As the inspection machine rewinds the paper, an automatic tensioning device applies uniform tension, so that the finished roll may be easily handled without "telescoping." Finished rolls are automatically ejected, then loaded and shipped to the printer or label house.

At the label house, the paper can be printed by letterpress, offset gravure or flexography. Labels are then cut into one of several forms. They may be die-cut in single or multiple width rolls with waste material removed between rolls; die-cut into individual labels; cut into single or multiple width rolls with labels separated by knife cut; or cut into sheets with labels die-cut or separated by slits. In the die-cutting operation when a carrying tape is desired, careful control must be maintained, as the die must cut through the label but not through the glassine backing.

Artwork for the labels, in most cases, is provided by the label houses, which generally maintain specialized art staffs.

Not long after the introduction of pressure-sensitive labels, it became apparent that for rapid labeling some means would have to be found for taking them off the glassine carrier tape automatically. It was discovered that if the carrier tape is pulled along a flat surface in one direction and then around a sharp curve, the label will separate itself from the tape.

As a result, the customer today has a choice of methods for applying the labels. He can get the labels in roll or sheet form and pull them

off one at a time by hand; a cardboard dispenser which strips the labels from the tape one at a time; a manually or electrically operated dispenser designed to keep pace with production line work; or, finally, a fully automatic dispenser-applicator keyed in with a moving production line that automatically strips and applies labels to the units as they pass by the labeling point.

Many firms, particularly retail stores, imprint price and other information by machine rather than by hand. Such firms buy pressure-sensitive labels printed only with the store name. The labels are put up in narrow rolls and only partially separated from each other by a perforation. This roll is then run through an imprinting machine to apply price or other information the store requires.

There are several firms that specialize in supplying retail stores with a complete line of marking machines as well as a variety of types of labels to run through these machines. Everyone is familiar with the pin-on tickets, and ordinary water-gummed labels that are found on merchandise in most department stores. Pressure-sensitive labels for use in these same machines were first offered about 1935. Today the pressure-sensitive label is the biggest single type used in department stores. Acceptance was slow at first. But once the stores realized the ease and speed of application and the fact that the labels would not dry out and fall off but were always removable, the growth became spectacular.

In addition to price marking, pressure-sensitive labels incorporate all kinds of information for the ultimate user of a product. In some cases the label is an integral part of the product, such as the design on a toy or a dial on an instrument, a name plate on an appliance, or a trademark on a gift item. Pressure-sensitive labels are being put to every conceivable use, and new uses continue to pop up every day. Certainly those who back in the 30's began spreading sticky adhesives on paper and punching out little round labels, had no idea then of the tremendous impact their persistent efforts were going to have on the labeling world.

# Room Temperature Formulation Bonds Alnico to Aluminum

An integral part of the ticket and label marking equipment manufactured by Soabar Co., Philadelphia, Penna., is an Addressograph plate holder in which an alnico magnet is positioned in a highly machined aluminum section. The permanent joining of these two dissimilar metals posed a difficult production problem which could only be solved satisfactorily through the use of a modern synthetic resin adhesive.

Preliminary attempts at welding the two metals not only involved added labor costs—because of the high degree of skill required to work with these critical materials—but also such potential hazards as burn-through of the aluminum and disorientation of the magnet due to the relatively high heat involved.

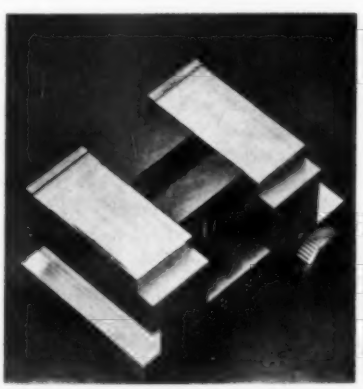
### *Other Methods Tried*

"Liquid solders" also proved unsatisfactory as bonding agents since they produced erratic results. For example, it is important that the precisely ground magnet coincide in level with the surfaces which locate and support the Addressograph plate during the imprinting operation. Such accuracy of position was extremely difficult to achieve using the liquid solder joining technique. In addition, if the plate holder were inadvertently dropped or jarred, the magnet frequently separated from its aluminum holder.

An efficient, economical method of mass production assembly was evolved through the use of a two-component epoxy-based adhesive formulation. Room temperature curing, thixotropic and 100 per cent reactive, Bondmaster M688 and its Hardener CH-16 are products of Rubber & Asbestos Corp., Bloomfield, N.J. On a purely cost-of-material basis, the adhesive selected, priced at less than $2 per pound, provided better over-all performance and more simplified production techniques than had been attained with $18 per pound silver solders.

Soabar found the adhesive formulation is simple to mix. Since its mixed viscosity is that of a heavy cold cream, it could be applied easily for exact positioning. Furthermore, the problem of levelling the magnet was also completely overcome by the thixotropic nature of the adhesive which eliminates sagging or running both during application and subsequent cure.

Since the modified epoxy formulation cures overnight at ambient temperatures, it eliminates any need for application of heat and thereby entirely removes the hazards normally present when conventional joining techniques are attempted.



**The alnico magnet in this Addressograph plate holder is bonded to the aluminum casting with a modified epoxy adhesive which cures at ambient temperatures.**

by MATTHEW W. WILSON
Senior Development Engineer
Tire Textile Development
B. F. Goodrich Company
Akron 18, Ohio

# Tire Fabric Adhesion and RFL

**The switch from cotton to rayon tire cord meant that tire manufacturers had to develop an adhesive capable of bonding smooth synthetic filaments to rubber**

THE story of tire fabric adhesion in the last twenty years or so has been, to all intents and purposes, the story of RFL, resorcinol-formaldehyde-latex, an adhesive invented by Dr. W. H. Charch, a DuPont chemist, for use in bonding tire cord rayon to rubber (1).

Rayon was developed as a stronger replacement for the cotton tire cord then in use. Whereas cotton had for the most part been used without any adhesive treatment because its short fiber nature gave it a certain amount of natural or mechanical adhesion to rubber, when rayon with its smooth filaments was substituted it was soon realized that an adhesive was needed. The result was RFL, a water system involving rubber latex with a water-soluble resin mixed into it.

Those unfamiliar with RFL and tire cord adhesion tend to fall into two groups. The "sophisticates" think that there are any number of substitutes and modifications which could just as well be used. The "innocents" look at RFL with great wonder and have little notion of why such a concoction can do the job. Actually, the story of RFL lies somewhere between the imagining of these two groups.

Though a certain amount of substitution or modification is possible, for the most part the RFL system is a very specific one. For example, you just cannot substitute for the resorcinol-formaldehyde resin any resin you would like to, such as urea-formaldehyde, melamine-formaldehyde, or even phenol formaldehyde — although the latter does have possibilities. On the other hand, the phenomenon of adhesion produced by RFL can be described in a fairly simple and logical scheme.

### *How It Works*

Perhaps the most interesting approach to RFL is to draw a picture of how we think it works. Of course, pictures or theories require data for their inception and proof, but there are lots of interesting data which can be called upon to support the picture we shall draw.

First of all for the background of the subject: To make RFL, we first make a solution of resorcinol and formaldehyde in water with a little alkali for a catalyst. If we use enough formaldehyde and let this mixture stand long enough, we get a gel. If we take this gel, dry it and mold it under heat and pressure, we get something that reminds us of a phenolic resin. We therefore identify resorcinol - formaldehyde made this way as a member of the phenolic resin family.

However, in making RFL we do not let the resorcinol-formaldehyde solution age to the point of gelation or obvious resin formation. We age it for a shorter time and then mix it with some rubber latex. We dip some tire cord in the mixture, dry it, put it in rubber, cure it, and find that there is powerful adhesion between the cord and the rubber.

Why should such a mixture give such strong adhesion between a tire cord and rubber? Consider the original tire cord for which this RFL was intended — rayon. Rayon is cellulose and we know that resorcinol-formaldehyde will stick to cellulose. In fact, if the right solvents are used to prepare resorcinol-formaldehyde as a syrup, and the correct formulation used, the result is a most excellent wood glue. Wood, of course, is cellulosic.

So we can say that part of this RFL sticks to one of the elements we are trying to stick together. The other part of the adhesive is latex rubber and, of course, rubber should stick to rubber. Rubber generally needs a cure or vulcanization for good cohesion or adhesion of rubber-to-rubber. However, there are plenty of curing ingredients in the rubber coat, which is the other element of our adhering pair, and these curing ingredients can migrate into the latex rubber. If we don't trust this to take place, we can always put some sulfur and accelerator in with the RFL.

At this point we have postulated that one of the components in the RFL sticks to the rayon cord and the other sticks to the rubber coat.

To complete our adhesion picture, we need only imagine that after being dried out on the cord, the resorcinol-formaldehyde and rubber latex exist as a brush pile in which the resin and the rubber are entangled. Part of this brush pile is material which sticks to the tire cord, the cellulose; the other part of the brush pile is a material which will stick and cure to a rubber coat after application and cure. The brush pile will be the real boundary between the adherents and is the place at which the greatest strains should occur.

This brush pile of resorcinol-formaldehyde and latex rubber has been investigated for other possible uses and in doing so it has been demonstrated that there is a definite natural affinity between resorcinol-formaldehyde and latex rubber. The French chemist J. Le Bras (2) has shown that the strength of a sheet of RFL is greater than that of the latex without the RF. Thus, there is more to it than a mechanical brush pile.

### *Primary Chemical Bonds*

We think of the reinforcement of rubber by carbon blacks and certain other pigments as being more than mechanical. We think in terms of secondary chemical bonds. In the case of RFL, one might also want to think in terms of primary chemical bonds because we do have such a thing as a resin cure of rubber and we have chemical mechanisms (3) to rationalize this phenomenon.

There are much data which substantiate this adhesion picture, but first let us look at the picture we have just put together.

Figure 1 is the picture using structural chemical symbols and, in addition to what has already been described, postulates the type of force (4) which holds the resorcinol-formaldehyde to the cellulose. At the surface of the cellulose, the resorcinol-formaldehyde resin is seen adhering through dipole-dipole or hydrogen-bond forces. Proceeding on toward the rubber coat, there is an entanglement of resin and latex rubber within which strong secondary valence bonds (and perhaps some primary resin-cure-of-rubber bonds) exist. Finally, on reaching the rubber coat, there is a bonding by vulcanization between the rubber coat and the latex rubber.

If this is the way rayon tire cord adheres to rubber, what about other tire cords? What about nylon? Nylon also has strongly polar groups which serve the same purpose as the OH groups of the cellulose. What about Dacron? Here there is some negative support for the adhesion picture in the fact that Dacron does *not* adhere well to rubber through an ordinary RFL treatment. Although it has polar groups of some potential, mainly ester groups, Dacron also has lots of bulky benzene rings to get in the way.

Good bondable Dacron can be had with RFL, but only after some preliminary treatment to provide the necessary polar groups. If one can cover the Dacron with a film of material which can hold on through its own internal strength and through the weaker or less available polar groups, and if in addition this film has many strongly polar groups available for RFL adhesion, then adhesion is possible.

What about polypropylene and the other members of this family? Again RFL does not work very well since there are no strongly polar groups for it to attach to. Here, too, it is necessary to make some surface modification of the fiber to provide something to which RF can bond.

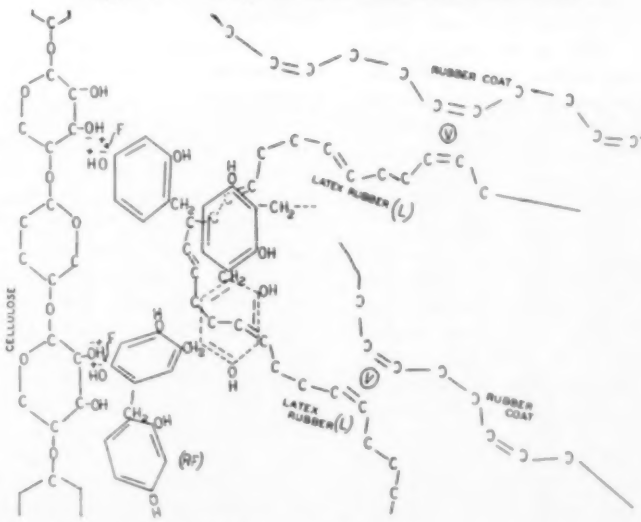
At this point you may ask how adhesion can be improved by applying this information. We have already shown the part played by the fiber itself. We can extend this observation by noting that the type of surface finish put on the filaments by the supplier has been found to have an effect on adhesion.

### *Facilitated Yarn Handling*

Fiber finishes are lubricants intended to facilitate yarn handling by the supplier and to some extent to benefit the user. If this material is highly hydrophilic or water attracting, it can be penetrated by a water system such as RFL and may actually help the wetting process. On the other hand, if the lubricant is highly hydrophobic or water repelling, the RFL will have difficulty getting through to the filament and bonding with it.

Going over now to a consideration of the coat-to-latex bond, anything that will aid in the formation of a tough rubber-to-rubber bond will improve the adhesion. The compounding of the coat will be important. The softness of the rubber stock, the speed of the cure, the

**Figure 1—Rayon-RFL Adhesion Scheme**




F = dipole-dipole or H bond attraction. V = vulcanization bond.

toughness of the latex used are all factors.

At this point art takes precedence over science — as it does in much of rubber compounding. However, there are some simple and obvious rules. The latex used must have some compatability with the coat stock. For example, for butyl rubber coat adhesion one would want some rubber latex compatible and curable with butyl; Hevea rubber latex could not be expected to work very well.

Consider now the mixture of the rubber and latex (the brush pile we talked about) in which the real adhesion boundary must exist. How is this improved? A big advance in RFL technology was the use of a copolymer of vinyl pyridine in the latex component. This was another invention of a DuPont researcher, Dr. C. J. Mighton (5).

The best way to explain the advantage of the use of pyridine attached to the latex rubber is by postulating that this pyridine should improve the bonding of the resin and the latex rubber within the brush pile. Pyridine has a nitrogen which is basic in character and should have an attraction for polar groups, especially any that have some acid character such as the OH groups of resorcinol.

Here's how we handle this operation at Goodrich. Our Chemical Division prepares two very fine latices which are terpolymers of butadiene, styrene and vinyl pyridine. These are Hycar latices 2508 and 2518. We use 2508 as the major latex component of our nylon RFL dip and other people use 2518 for tire cord dips and square woven fabrics, such as non-wicking finish strips.

Other means to better bonding within the RFL film are probably yet to be discovered. What is probably needed is a good or better cure within the resin-rubber agglomerate.

When any one of these three factors (the fiber surface, the internal condition of the RFL film, or the latex rubber-to-coat bonding) is positively adjusted, the adhesion is improved; no single factor governs the whole scheme. There is one simple way to take positive advantage of two of the factors — simultaneous bonding at the fiber and bonding at the coat. If a high dip pick-up is used, a big positive influence on both these factors is obtained because there is more probability of finding bonding sites at the fiber surface and at the coat stock surface region.

This idea always disturbs those who are used to thinking of adhesion between two smooth surfaces and know that the best condition is the thinnest possible continuous layer which completely wets both surfaces. However, tire fabric adhesion is a different situation. You do not find all the bonding sites you need at the crenulated tire cord surface without a large amount of dip and you do not get all the meshing you need with the rubber coat unless you have a *large* amount of dip. By *large* is meant something between five and ten per cent. The adhesive is a tough, flexible material which can stand being thicker than the optimum for rigid adhesives.

### *Theoretical To Practical*

Now that we have discussed RFL from a theoretical point of view, let us go to the practical.

The first item of practical importance is testing, and the first testing procedure that one probably imagines is simply pulling a cord out of a rubber block. A little more refinement gives one the very widely used H-test. For this test a cord is cured in two little blocks or strips of rubber which are gripped and pulled.

At Goodrich, we have another test which we like better. This is one invented by our Dr. E. T. Lessig (6). In this test, instead of pulling a cord out of rubber, the rubber is squeezed off the cord under forces which start out perpendicular to the cord axis. The immediate justification for doing it this way is that in a tire most separation forces start this way. The cords of the tire, at the point where the tire pounds against the road, will lie in planes which are more or less parallel with the road; at any rate, in a tire the cords get squeezed. I do not think there are any separation forces in a tire that correspond to the forces involved in pulling a cord out of a block of rubber.

Figures 2, 3 and 4 are similar to those shown in Lessig and Compton's paper (6). Figure 2 shows the embedding of the cords in a block of rubber and is essentially a schematic representation. Figure 3 shows the test samples which are little cylinders with the cord to be tested running diametrically through their centers.

In Figure 4, the sample is shown being squeezed to produce adhesion failure. The squeeze normal to the cord eventually produces strain components along the cord and when the sample undergoes a sudden and radical change in shape (in which it appears to "pop") the rubber has been squeezed off all or part of the cord.

Let us now investigate some of the details involved in making and using RFL:

(A) A 10 per cent resorcinol-formaldehyde solution in water is made up and aged for several hours to obtain a sufficient reaction.

(B) Next, a synthetic latex which generally runs from 23 to 40 per cent solids. For best results, this synthetic latex is generally a vinyl pyridine copolymer latex. A little natural latex may also be desirable. The latex component is diluted with water and the resorcinol-formaldehyde solution is stirred in. Ammonia and/or sodium hydroxide solution are added to provide stability as well as aid in getting the desired cured adhesion properties. The RFL ends up with a solids content generally ranging from 10 to 20 per cent.

(C) There is an optimum aging time for the dip before it is used and each user must determine this optimum time for himself.

(D) The dip is now ready to be used. The cords are run through the dip under a reasonably low tension. This tension will be of the order of one-half pound per cord for the present smaller rayon and nylon cords. The dipped cord may then be passed through squeeze rolls if a high penetration into the cord is desired. Excess dip is removed by shaking the cord, by blowing on the cord, or by a vacuum remover. In general, the solids pick-up on the cord and will run from 3 to 7 per cent.

(E) The cord is then dried and, in the case of nylon, it may also be

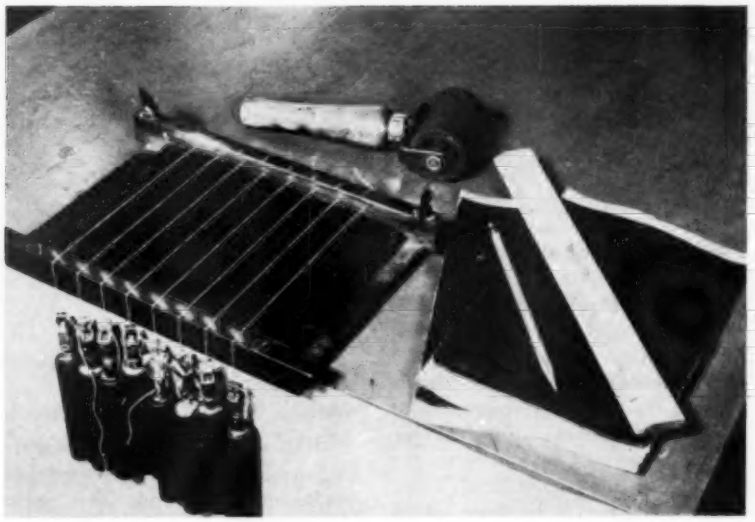


Figure 2—The embedding of cords in a block of rubber is the first step in a testing procedure used at B. F. Goodrich. The rubber is squeezed off the cord under forces starting out perpendicular to the cord axis—just as in actual use.

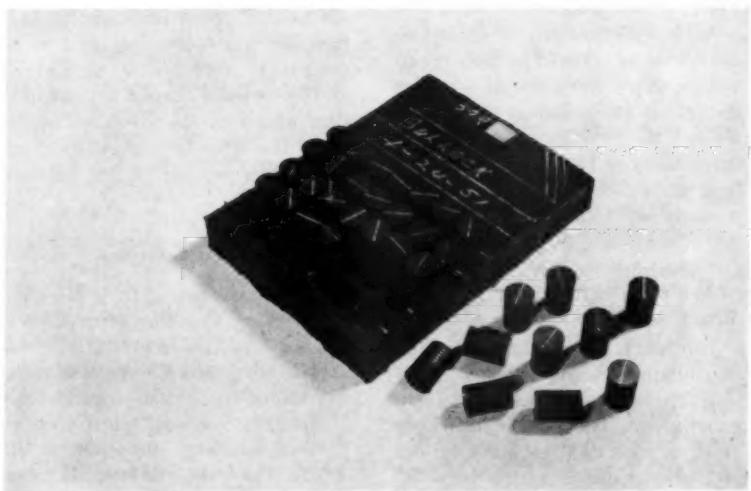


Figure 3—Test samples used in the testing procedure described in this article. The cords run diametrically through the centers of the little cylinders shown here. The Figures on this page are similar to those shown in Lessig and Compton's paper on the subject.

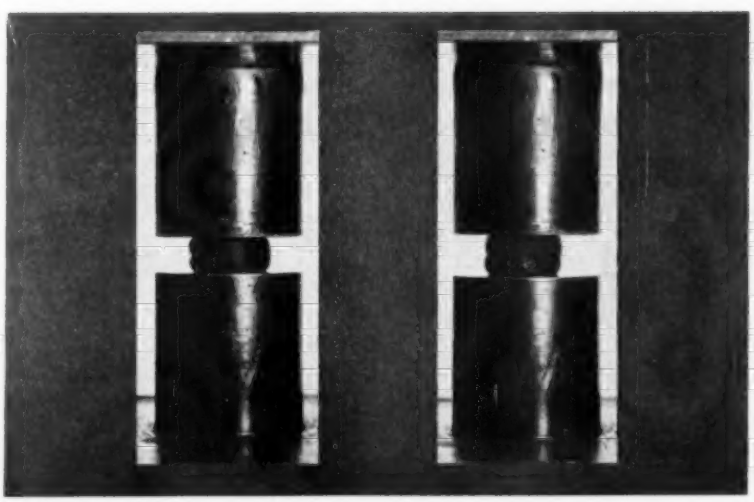


Figure 4—Test cylinders with the embedded cord are squeezed to produce adhesion failure. A sudden and radical change in the shape of the cylinder indicates that the rubber has been squeezed off all or part of the embedded cord.

heat-set. One finds that there is an optimum drying and baking treatment for adhesion. Too little baking gives low adhesion, as does too much baking.

In the drying or baking step, which will be of the order of several minutes at 250° to 300°F., the resorcinol-formaldehyde resin is cured. Resorcinol-formaldehyde is a fast curing resin and this may be the reason for its use in such a system as against phenol-formaldehyde, m-cresol formaldehyde and other cousins. Some of its cousins do not do too badly, but most of them are slower curing resins. One other thing, if you want to try members of the phenol family other than resorcinol, only those which have three reaction spots should be used. The resin must be one that cures.

As stated, the resorcinol-formaldehyde resin is cured in the drying-baking step — you do not wait for the rubber vulcanization to cure the resin. The rubber vulcanization cures the coat stock to the latex. One may postulate that it is apparently only the latex part which cures, since we have shown that a good preliminary cure of the resorcinol-formaldehyde resin gives optimum adhesion.

Too much baking in the drying step unquestionably lowers adhesion. This may be because you can go a little too far with the resin cure or it may be that the latex rubber becomes oxidized, which in some way reduces the adhesion potential.

(F) Calendering always produces more adhesion than you will get by ordinarily laying a dipped and dried cord between two slabs of rubber in the laboratory. Continuous dipping, drying and calendering is the best situation. A cord which is baked to the optimum with a moisture content of less than one per cent and then run hot with a soft hot stock on the calender gives the ultimate in adhesion.

So far, the discussion has been confined to tire cord, but there are other fabrics in the tire as well as the cord fabric. These are the bead wrap, the flipper, and the chafer. Until recently, these have mostly been cotton fabrics and adhesion has been mainly a matter of mechanical bonding and strike-through.

However, with the advent of the tubeless tire, a dipped chafer fabric came into the picture. This chafer fabric may be made from woven monofils or from regular textile yarns. When regular textile yarns are used, dipping of fabric in RFL has two functions. The first is to completely impregnate the yarns and block them against any possible flow of air in the direction of the yarn. The other function of dipping, of course, would be to produce adhesion.

### *Preparing Special Fabrics*

The preparation of these so-called non-wicking finishing strip fabrics is a very specialized one. High pressure padder rolls are necessary for the desired impregnation and a tenter frame is needed for drying to prevent shrinkage distortion of the fabric. Thus, we find that RFL has an important use for the tire industry beyond that of producing adhesion.

With the increase in heavy duty requirements for truck and airplane tires and with the introduction of such strenuous operations as post-cure inflation of tires, the flipper, bead wrap and chafer fabric must be of tougher material and must have a much higher order of adhesion. Simple mechanical adhesion becomes inadequate. Materials such as nylon and rayon are desirable for these fabrics.

Mechanical adhesion in the case of these materials would be practically nil. When rayon or nylon square woven fabrics are substituted, you not only have a much tougher fabric but with RFL dipping you get tremendously more adhesion than from a cotton fabric which has been frictioned and coated.

The best competitors for RFL that I am aware of are the diisocyanates. However, I doubt if they are much used in tire fabrics.

They might be used in two ways. The diisocyanates (or polyisocyanates) can be mixed with a rubber cement and I think that, other things being equal, the best polymer to use for this rubber cement is one which has a quantity of polar groups. Diisocyanates may also be used in what is known as their blocked forms either a reaction product which prevents room temperature hydrolysis or one which has a slow rate of reaction with water. These blocked forms may be mixed with latex and they are, therefore, substitutes for the resorcinol-formaldehyde part of the dip.

I believe that the diisocyanates act in a similar way to the resorcinol-formaldehyde. They undoubtedly end up as a resinous material through hydrolysis and polymerization. They have polar groups which can hang on the polar groups of the fibers and, as a result of their polymerization, they probably form a brush pile with the latex or cement rubber just as does the RF.

There are undoubtedly other materials which can be substituted for the resorcinol-formaldehyde or the diisocyanates and give at least reasonably good adhesion to rubber. Every now and then a suppler appears with a resin which he feels will cut our dip cost in half and give us much finer properties than we get from RFL. Some of these resins do give a certain amount of adhesion, but nothing has come close to resorcinol-formaldehyde.

**About the Author . . .**

MATTHEW W. WILSON has been with Goodrich since 1940 working on textiles and adhesives. He received his Ph. D. in Chemistry from Western Reserve University.

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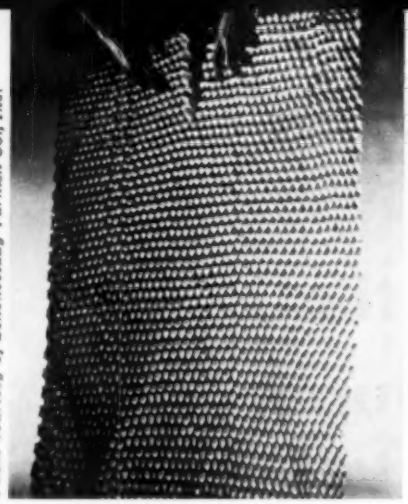


Photo courtesy of Schenectady Varnish Co., Inc.

**Resins and adhesives are used in honeycomb core manufacture during preliminary impregnation of the stock, to bond the material together, and in making the final sandwich**

# How Adhesives Are Used in Honeycomb

Honeycomb material is made from both kraft paper and metals such as aluminum and stainless steel. Production methods vary considerably, in that metal honeycombs are usually brazed to other metal laminae, whereas paper honeycomb is adhesive bonded to other elements in the sandwich construction. Several patented processes have been developed for manufacturing paper honeycomb core, but it is believed two of these practically dominate the field.

In one process, paper sheet material which has been preliminarily resin-impregnated, is formed and cured in a continuous corrugating machine. The cured corrugated sheets are cut to predetermined length and assembled into an expanded block. After curing this block is sliced into sheets of required thickness.

In some instances, a water-soluble phenolic resin is employed for paper impregnation, after first being diluted to about 35 to 40 per cent concentration. A mixture of equal parts of water and alcohol (to reduce paper breakage) is used for dilution. The diluted resin solution is pumped to the reservoir of a special paper-treating machine and an air-powered agitator keeps it in proper solution.

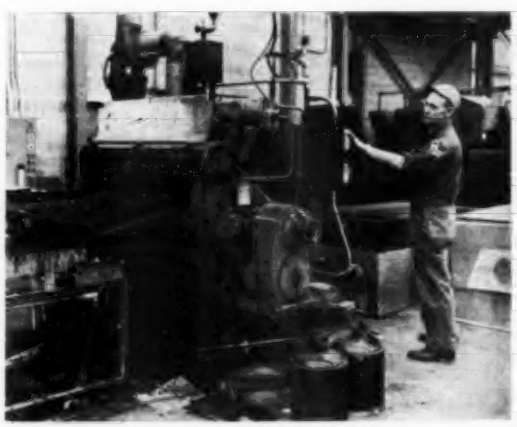
In the second basic process used, previously-impregnated paper sheets are first strip-glued and then pressed into a flat assembly. The resulting pad, or pack, as it is sometimes called, is subsequently cut into strips which are expanded to form a honeycomb-core block. After the impregnated resin has been cured properly, this type of honeycomb core stock will maintain its expanded shape.

Paper honeycomb core can be obtained from its manufacturers as a custom product made to meet specific requirements. There are also standard products which can be modified for greater strength properties through changes in methods and materials employed.

Resins and adhesives come into play during three phases of paper honeycomb manufacture. One of these is preliminary impregnation of the kraft paper stock. In the next phase adhesive is employed to bond the material together. Finally, adhesive is applied to flat surfaces of the honeycomb just before it becomes one of the laminae in an actual sandwich construction. For this application, a method much preferred by many operators involves use of a mechanical glue spreader to coat both sides of the material in a single pass.

In most instances where this method is to be employed, paper honeycomb stock is made just a little thicker (often about 1/16-inch) than the final thickness dimension it should have. Enough pressure is exerted by the glue-spreading rolls to crimp the surfaces just slightly, thereby providing a greater contact area for the adhesive and for the facing materials at the ends of the cells.

Whichever method of honeycomb manufacture is employed, it is obvious that those who specialize in providing resins for such purposes can give excellent counsel as to proper selection in any given case.



**A hooded mechanical spreader coats both sides of honeycomb core stock simultaneously (Photo courtesy of Black Bros. Co., Inc.)**

# Merchandising and the Adhesives Manufacturer

**Some of the deciding factors in setting up a retail level campaign are outlined by the general sales manager of a medium sized adhesives manufacturing operation**

By E. R. FALKENBURG
Miracle Adhesives Corporation
Bellmore, L.I., N.Y.

There is not a great deal of difference between the basic retail merchanding problems of a large or small manufacturer of adhesives. The differences are mainly in degree. If any approach can be said to be typical and perhaps applicable to the industry in general, it is probably that of the small to medium sized operation such as we have at Miracle Adhesives Corporation.

Ours, of course, are not the only methods, nor necessarily valid for every producer. But having proven sound for our purposes over a significant period of time, they may well offer reliable guide lines to many.

Large or small, all sales promotion efforts start with a budget; and before a budget can be determined, the over-all advertising appropriation, in which merchandising will be included, must be established.

To arrive at this, either of two basic formulas may be used: the percentage of sales basis, or the percentage of projected sales. Possibly the most desirable formula would be a combination of both arrived at by taking the sales figure for the past year, adding the sales projected for the next year, and dividing by two.

To enable us to take advantage of expanding markets, however, we at Miracle prefer to base our budget directly on projected sales. A flat percentage of this sales forecast is then adopted as the advertising budget figure. Just how large a percentage would be governed by factors such as:

(a) The competitive stage of the advertised product.

(b) The gross profit of the manufacturer.

(c) The basic policies of the company as a whole toward merchandising.

### *An Over-all Figure*

But having worked this out with due regard to these and other governing complexities, we arrive at an over-all budget figure. Now the fun begins, because this has to be broken in a multiple of ways.

(1) By trade. For example, how much of the total will Miracle spend for (a) over-the-counter sales, (b) the insulation trade, (c) the ceramic

**About the Author . . .**

E. R. FALKENBURG, executive vice-president and general sales manager of Miracle Adhesives Corp., joined the company in 1947. Previously, he had been general sales manager of Cofax Corp. Mr. Falkenburg majored in marketing at New York University where he received his BS degree. He has been associated with International Plastics Corp. and Minnesota Mining.

Projecting Future Sales

tile business, (d) general architecture, (e) general building, etc?

(2) How much of the amount allotted to each trade is to be spent for merchandising, advertising space, direct mail, publicity aspects of the campaign?

At last able to concentrate on the budget figure for merchandising, we must now determine how much of our allotment will be expended for each product (or group of products). In some companies this might mean each department. In Miracle it means each company; in the insulation trade, for instance, we have three companies—each marketing a different product. Miracle Adhesives Corporation, insulation adhesives; Miranco, Inc., Miracle Anchors; and Insul-Fil Company, underground pour-type insulation.

Still another apportionment must be decided upon if it is desired to use the unit-of-sale method of setting up an appropriation, which allocates a fixed sum per item to be sold.

### *Specialty Consumer Items*

This principle has many advantages, which we have explored with a good deal of success in relation to several specialty consumer items on which we were able to establish a relatively high list price. Miracle Tub-Caulk, for example, lists at $1 for a four ounce tube and Black and Brite Magic at 59¢ in 2¾ ounce tubes.

At these prices we were able to extend normal trade discounts, establish a promising merchandising plan, and still come up with a satisfactory profit. The bulk of our advertising dollar for these items was spent at the dealer level. Today most people are looking for advice when they drop by the store to solve a home "fix-it" problem. If a Miracle product will do it, and if the dealer makes a greater profit selling that product, what else is he in business for?

For this reason we offer a bonus deal in which we package two tubes free with six, and four free with twelve. This raises the dealer's profit from 40 to 55 per cent. The results of this have been most gratifying; we calculate that with all the competition we have today in

Education in a Humorous Vein

caulkings in tubes, including some with a much larger tube and some with a much lower list price, we still enjoy the highest percentage of this business.

A few years back when chemicals were "hot" in department stores we ran a similar promotion there. However, instead of giving one third in free goods we calculated this in an extra discount. We ran what was known then as our 40-40 deal with *no jobber participation*. The department store bought and was billed at his normal 40 per cent discount. If he advertised Miracle Tub-Caulk we allowed him an extra 40 per cent toward this advertising payable on proof of ad. The 40-40 was equivalent to a jobber's 40 and 25 with free goods included.

This promotion was run successfully over a period of several years and I can never remember receiving one jobber complaint. What actually happened was that the department store ads created a market for Tub-Caulk among the smaller dealers, and the jobbers automatically enjoyed more business than they ever had before.

Though the unit-of-sale formula has limitations, tremendous impact can be created by a properly coordinated merchandising campaign budgeted to include packaging, promotional literature, advertising and publicity, all focused on selling the benefits of a specific product. One of Miracle's earliest campaigns is indicative of how such a program can be put together, and still merits analysis as a notably successful effort.

### *Introducing Larger Sizes*

When it was determined that the time was ripe to introduce the larger size tubes and cans of Black Magic to the retail trade through normal jobber channels, a publicity release (with photo) went out to some 75 trade magazines, advising the trade that Miracle was giving away a metal display stand, the Midget Merchandiser.

Simultaneously, full-page two-color ads were placed in several of the magazines.

We now had a problem in that we had to be sure that after we sold the jobber his salesmen would push the Midget Merchandiser. To put it another way, we had to reach the jobbers' salesmen in whose catalogs Miracle Black Magic was a very insignificant item.

We decided on an eight-page educational brochure, done in a humorous vein to make sure they'd read it all and come away sufficiently impressed to mention Miracle during

A Balanced Merchandising Program

their rounds to the trade. Some ten thousand of these were distributed throughout the country. The jobbers' salesmen got many a laugh from them—and at the same time learned precisely how to approach the dealer with the Midget Merchandiser.

In addition, we ordered reprints of the full-page ads and made them available to the jobber as a direct mail piece. Space was left on these for him to use a stamp, or if he wanted them in quantity we offered to print them for him.

### *Reassuring Jobber*

Naturally the jobber had to have a price sheet on the Midget Merchandiser. He wanted to make darn sure he wasn't absorbing any of the cost of the metal display. Also, perish the thought that he shouldn't have a colorful catalog page for his men.

Now, with the jobber taken care of, how could we assist the dealer or retailer so that the picture would be complete?

When the dealer received his Midget Merchandiser and stock of Black Magic, a large envelope with instructions was included in the carton. This envelope contained a 16-page Dealer's Adhesive Guide which fitted in the back of the cabinet. After all, what did the average hardware dealer know about Miracle? This Guide, therefore, contained complete information on the product, along with an illustrated index of applications.

When someone came in and said, for example, "I want an adhesive to hold a metal molding," all the clerk had to do was run down the index to molding, turn the page to the illustration, and recommend Miracle.

Secondly, we gave him 50 counter circulars describing how the homeowner could use Miracle. Third, a streamer for his window. Fourth, a reprint of mats available to the dealer directly from Miracle. And fifth, an announcement of a new Miracle product with the offer of a free sample to the dealer if he sent a self-addressed card for information. (In this way we were able to tabulate dealers all over the country who had our Midget Merchandisers; this was important because we were getting a continual flood of inquiries from consumers asking where they could buy Miracle.)

That was one of our first attempts at "a properly coordinated campaign." And a pretty good example it must have been, for although Miracle had anticipated good results, in a short time we were running into a two to three week back order condition.

Another all-important phase of merchandising is the emphasis on and follow through accorded to a specific theme or slogan which ties a market more closely to your own products. In this way a better selling job can be done in highlighting the specific and most important advantages of your brand over competitive items. As an example, in the building field Miracle has always merchandised around the slogan "Construction-by-Adhesion" which has been copyrighted for approximately twenty years. To tie in even our over-the-counter merchandising with sales in the building trade (because there is some overlapping) we now follow through with "Construction-by-Adhesion" appearing on our consumer display boxes.

### *Consistency of Method*

Campaign concepts may vary, and budgets certainly will whether we like it or not. But whatever success has attended our merchandising effort seems to us largely attributable to the consistency of method and approach I have tried to illustrate here.

Strategic budgeting, plus carefully planned coordination—of merchandising, literature, advertising, packaging, and publicity — cannot fail to provide substantial results.

This has been Miracle's formula from the outset, and if its record of serviceability to a medium sized manufacturer of adhesives is any proof of soundness of principle, it must have some degree of validity for the industry in general.

*The above article is based on a speech delivered recently to the Rubber and Plastic Adhesive and Sealant Manufacturers' Council in Cleveland, Ohio.*

## RTV Silicone Rubbers Seal Space Capsule

The Project Mercury space capsule that will carry the first American astronaut into space will be sealed against air leakage by room temperature vulcanizing silicone rubbers.

Engineers of the McDonnell Aircraft Corp., which is building 20 Mercury space capsules for the government, have specified formulations developed by the Silicone Products Department of the General Electric Co., Waterford, N.Y. They will be used around rivets and bolts wherever structural material overlaps or butts together.

The silicone rubber will be applied to conform exactly to the surfaces being sealed and allowed to cure at room temperature to form a secure bond. Seals will withstand temperature extremes from —70°F. to above 600°F. and are said to be virtually unaffected by ozone and other factors that cause rapid deterioration of most rubbers and sealants.

According to G-E, the materials being used on the capsule are RVT-20 and RTV-90. The former is a pourable liquid and the latter a stiff paste. Silicone rubbers are already used extensively in conventional forms for seals and gaskets on missiles and high-performance jet aircraft.

NEWS of the

ADHESIVES WORLD

# Adhesives Session Held at Annual TAPPI Meeting

Five papers on adhesives were presented at an Adhesives Session held during the 46th Annual Meeting of the Technical Association of the Pulp and Paper Industry at the Commodore Hotel in New York City on February 20 to 23, 1961. R. C. Brown (U.S. Envelope) served as chairman of the Adhesives Session, which was attended by 250 persons.

The adhesives papers presented were: "The Adhesion Machine" by E. Weizenhoffer and Dr. F. C. Campins (Polymer Industries); "Effect of Viscosity on the Penetration of Adhesives into Paper", by R. M. Karapetoff Cobb (Lowe Paper); "Surface Analysis and Adhesion", by W. T. M. Johnson (DuPont); "Factors Which Affect Adhesion of Cellular Fibers in Paper" by J. W. Swanson (Institute of Paper Chemistry), and "The Effect of Relative Humidity on the Drying of Adhesives", by G. L. Barlow (Monumental Adhesives).

In his talk, Dr. Campins stated that with the qualifications for performance of bonded structures on the increase, and with the materials to be bonded having greater inertness than heretofore, it becomes important to know how to increase the effectiveness of the adhesion machine. He pointed out that the central goal of adhesion engineering is to redefine, redesign, control, and so to improve the effectiveness of the adhesion machine and to supply its product with the new performance values needed. While a series of unit-adhesion processes is generally involved, Dr. Campins continued, and while there are several unit operations within each process, the responsibility of the adhesion engineer is to understand thoroughly a minimum unit process, where only one interface of adhesion is generated.

Miss Cobb, in the second paper to be read at the session, declared that in order to study the effect of viscosity upon the penetration of aqueous media into paper, one naturally turns to adhesives and thickeners. In this work, she explained, the penetration of the following seven adhesives or thickeners into two widely different unsized base stocks has been followed by using a slightly modified version of TAPPI M-451 M-48: (1) Casein, (2) High viscosity soya protein (3) Low viscosity soya protein, (4) Starch, (5) High viscosity carboxymethyl cellulose, (6) Medium viscosity carboxymethyl cellulose, (7) Low viscosity sodium alginate.

Results are in accord with the equation

$$I^2 = \frac{r \sigma \cos \theta t}{2 \mu}$$

on which Lowe and the speaker based the contact angle theory of sizing introduced in 1934. Miss Cobb added that application of the findings in this work to paper making, coating, printing, or gluing operations, however, must be modified by taking into account the specific factors governing each individual commercial process.

In his paper on "Surface Analysis and Adhesion", Mr. Johnson stated that adhesion is primarily a surface matter, and whether two films will stick together when placed in contact depends on the chemical compositions of the first few molecular layers at the film surfaces. He went on to explain that these surface layers are different from the total film compositions and may not be determined from total film formula. Surface compositions may only be known by direct analysis. A way has been discovered to analyze film surfaces — the upper 25 to 50 (estimated) angstroms of films.

This method is to polish the sur-

**NOTICE**

**Perceptive readers will note that this issue of ADHESIVES AGE is mechanically bound. The change from our usual slotted binding has been occasioned by our transfer to a new printing plant. Within the near future our new printer will install equipment for adhesive binding and at this point ADHESIVES AGE will once again employ an adhesive binding technique.**

**The Publisher**

face of the film lightly with potassium bromide powder, which becomes contaminated with surface material. The powder is then pressed into a disc and the disc is infrared analyzed. This procedure yields the infrared spectrum of the film surface, which gives the chemical composition of the film surface as defined by the infrared spectrum.

### *Using Surface Analysis*

There are two ways one can use surface analysis to study adhesion, Mr. Johnson continued. First, surface analysis can determine the chemical compositions of the surfaces of the films involved in adhesion. Second, surface analysis can determine the locus or failure in cases of poor adhesion. It can determine whether adhesion failures are adhesive or cohesive, or are due to contaminant layers.

The fourth paper, presented by Mr. Swanson, discussed the mechanical, diffusional, and molecular aspects of adhesion, and their relative contributions to fiber bonding strength. Mr. Swanson pointed out that numerous factors affect the strength of the fiber bond. Among these factors are chemical and physical composition of the fiber, fiber dimensions, fiber strength, fiber conformability, surface area, swollen specific volume, bonded area, bonding strength per unit bonded area, distribution of bonds (sheet formation), and stress distribution.

### *Influencing Factors*

Many of these factors, he stated, are influenced in turn by temperature of the water, the presence of nonfibrous additives, and machine conditions. The final strength of paper is a complex function of these variables, and studies of new pulps or adhesives must take all of them into consideration.

The final session speaker, Mr. Barlow, declared that from all indications, penetration is the primary mechanism that accounts for the development of a fiber tear with aqueous adhesives on paper and paperboard. The moisture change in an individual sheet of paper follows a hysteresis curve, he explained, and the most rapid changes are at very low and very high relative humidities. Both papers and paperboards show these characteristics.

Mr. Barlow went on to say that the time necessary for an adhesive to develop fiber tear is apparently directly proportional to the moisture content of the paper or paperboard, provided the paper does not approach moisture actuation. This study indicates that the phenomenon of saturation does not occur with paperboards when adhesives are applied at normal film thicknesses. Even with 16 pound stock, he declared, the moisture content of paper must be rather high before saturation occurs.

With high solids emulsion, saturation does not occur in any of the papers or paperboards tested, since the removal of a small amount of water resulted in fiber tear. The experimental data indicates that an aqueous adhesive (dextrine or emulsion) has a fiber tear time near zero when the moisture content of the paper is zero, Mr. Barlow concluded.

Wharton Jackson

## Forms New Firm

Harrisons & Crosfield (America) Inc. and Wharton Jackson Co. have merged their western offices to form a new company, Harrisons & Crosfield (Pacific) Inc., with offices in Seattle, Wash., and San Francisco and San Marino (Los Angeles), Calif. The company will continue to supply industrial raw materials, chemicals and clays from domestic and overseas affiliates. Wharton Jackson is vice-president of the new firm, located in San Marino, Calif.

## 3M Reports Record Earnings in 1960

Earnings in 1960 for Minnesota Mining and Manufacturing Co. reached a record of $70,692,374, an increase of approximately 10 per cent from the 1959 earnings of $63,564,729. This is the equivalent of $1.38 per share of common stock, as against $1.25 per share for 1959. Net sales, too, were higher — $549,675,178, compared with $500,675,932 for the previous year. Foreign sales of $117 million accounted for 18 percent of the net sales figure. In 1959, foreign sales were about $95 million. The company reports that sales in each quarter were ahead of the previous year, with fourth quarter sales higher than any previous quarter in company history.

The sales breakdown includes: tape and allied products, 19 per cent; coated abrasives and adhesives, 13 per cent; graphic products, 22 per cent; electrical products, 17 per cent; chemicals and plastics, 5 per cent; building products, 5 per cent; foreign, 18 per cent; miscellaneous, 1 per cent. The amount spent for research and development and related activities was $21.8 million, with an estimated expenditure of $25 million planned for 1961. Plant and equipment expenditures reached a record level of about $39 million for new and improved manufacturing, distribution, and research facilities in the United States. A balance of $33 million in authorized work remained at the end of the year.

In April, 1960, 3M acquired the Mutual Broadcasting System, and in August, 1960, it acquired the Revere Camera Co. The 3M figures for 1960 include the two subsidiaries since their acquisitions.

## USSR Develops New Resin

According to reports, the Soviet Union has developed a new synthetic resin based on caprolactum, ammonium thiocyanate, and zinc chloride. Called Ekra, the resin is said to be a transparent, liquid-viscous material which can be used to make polythiocyanate - epoxy adhesives and rubber.

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***Let's Keep Rolling Ahead***

## Adhesive Firm Formed By Fuller in Argentina

H. B. Fuller Co., St. Paul, Minn., will manufacture and sell industrial adhesives for the Latin American market through a new subsidiary company located in Buenos Aires, Argentina. The manufacturing subsidiary, to be known as Fuller-Ulivi Bianchi, S.A., represents a joint venture of H. B. Fuller interests with those of Ulivi Bianchi y Cia, S. A., Buenos Aires, with each firm sharing 50 per cent ownership in the new company. Fuller-Ulivi Bianchi will lease plant and manufacturing facilities from Ulivi Bianchi, which presently produces a line of resins and plasticizers used in compounding adhesives.

Representing H. B. Fuller's interests is Richard E. Smith, vice-president for research and development, who has been named executive manager of Fuller-Ulivi Bianchi. Mr. Smith, who has been in Buenos Aires since September, 1960, expects to remain in the Argentina post for one year. He handled the transactions in setting up the new company, and will provide manufacturing information and know-how. In addition, he will be responsible for developing research and will be working with Argentine members of the company in developing sales of new adhesives products.

Richard E. Smith

## Hot Melt Adhesive System

A new granular hot melt adhesive system, consisting of an Instant Lok hot melt applicator and Instant Lok granular hot melt adhesives, has been developed jointly by the National Adhesives Division of National Starch and Chemical Corp., and the Potdevin Machine Co., Teterboro, N.J. The complete system is sold and serviced exclusively by National Adhesives. Potdevin Machine manufactures the applicator units.

The new system consists of a granular hot melt adhesive, which is placed in a hopper and premelted by passage through a heated extrusion unit. It is then applied to the surface through various types of nozzles and applicators, each designed for a particular use. Instant Lok adhesives are offered in a variety of formulations to adhere such surfaces as non-woven fabrics, porous filter material, combinations such as foil to foil, polyethylene to itself, foil to polyethylene or Mylar, wet strength papers, and waxed surfaces.

According to National Adhesives, the new system is particularly suited for bag making, fabrication of multi-wall sacks, carton forming and sealing. Advantages of the system are said to include: use of 100 per cent solids material, eliminating the cost of solvents; rapid start-up time; elimination of drying and compression units, and of the need for daily machine clean up; freedom from oxidation caused by exposed heating of the adhesive, and elimination of the need for premelt equipment, and freedom from mold and deterioration during storage.

## AUMA Elects Officers

The Automotive Undercoating Manufacturers Association, Pleasant Ridge, Mich., elected new officers for 1961 at its annual meeting, held in Cleveland, Ohio, on February 13. The new officers are: *President*, G. R. Widger (Tuff-Kote Asphalt Products); *Vice-President*, H. E. Hutson (Gibson-Homans); *Secretary*, N. P. Hudson (Lion Oil); *Treasurer*, C. N. Cox (Pittsburg Coke and Chemical).

## SPI Hears About Oxiron Epoxy Resins

Recent advances in the development of Oxiron epoxy resins were disclosed in a paper presented by Dr. Frank P. Greenspan, director of the Epoxy Department of Food Machinery & Chemical Corp., at the 16th Annual Conference of the Reinforced Plastics Division of the Society of the Plastics Industry, held on February 7, 1961, in Chicago, Ill. The paper, co-authored by C. W. Johnson of the FMC research and development laboratories, was entitled "Oxiron Resins — A Series of New Epoxy Resins."

Dr. Greenspan gave a detailed report on new Oxiron data on reactivity with various curing agents, curing systems for a range of end-properties, high-temperature properties, and promising laminate applications. He reported that the capability of these materials to cure through reactive double bonds as well as through epoxy groups permits the production of highly cross-linked thermoset resins with excellent high temperature properties and outstanding resistance to creep.

The paper also covered high-temperature properties relating to heat distortion under implied load, loss in strength or modulus, electrical performance, and thermal flow or creep, and described studies of applications of the resins in two specialty laminate areas—prepregs and printed circuitry.

## Armstrong Sales Hit High

Sales in 1960 for Armstrong Cork Co., Lancaster, Penna. are reported at $291,539,000, a record figure for the company. Earnings dipped slightly to $16,225,000, or $3.08 a share, but were still the second highest in the history of the firm. Earnings for 1959, the banner year, were $19,207,000, or $3.69 a share. Sales in 1959 were $290,620,000. Earnings of foreign subsidiaries amounted to $1,247,000 on combined sales of $29,575,000, as compared with earnings of $1,461,000 on sales of $26,259,000 in 1959. Capital expenditures for 1960 set another record for the company, totalling $22,827,000.

## TAPPI Holds Election

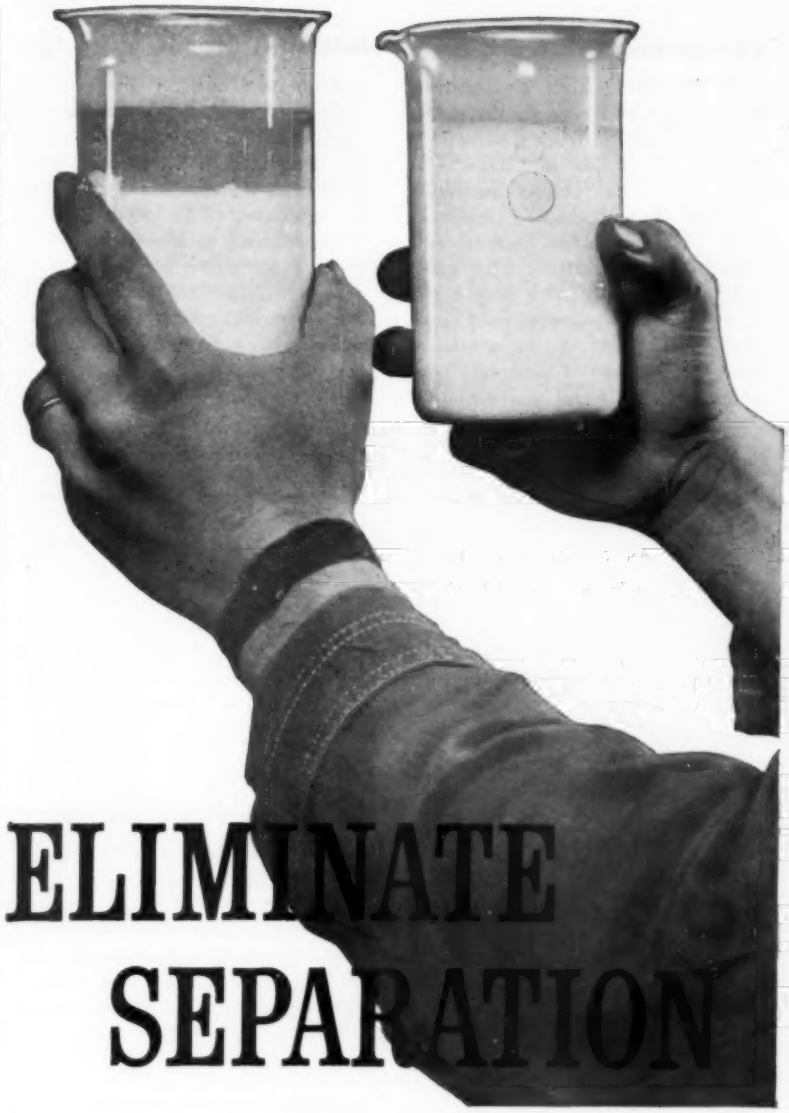
The Technical Association of the Pulp and Paper Industry elected new officers during its 46th Annual Meeting, held on February 20 to 23, 1961, at the Commodore Hotel in New York City. The following officers were elected to serve the association during 1961: *President*, Harold M. Annis (Oxford Paper); *Vice-President*, Dr. John C. Wollage (Kimberly-Clark); *Executive Committee*, William H. Aiken (Union Bag-Camp Paper), Paul W. Bartholomew (Minnesota and Ontario Paper), Glenn C. Kimble (Union Bag-Camp Paper), and W. P. Lawrence (Champion Paper and Fibre). The four-day meeting also featured 31 technical sessions which presented well over 100 technical papers to an audience of about 3000 technical people engaged in research and technology in the pulp and paper industry.

## Join Hysol Research

William I. Childs and Jimmy W. Hill have joined the research and development staff of the Hysol Corp., Olean, N.Y. Mr. Childs is a chemical engineering graduate of Pennsylvania State University. He previously has been associated with the Dow Chemical Co. in new product development. Mr. Hill is a graduate of William and Mary College and holds a M.S. degree in chemistry from Loyola University. In 1953 he was associated with DuPont, and for the past six years had been with the Quaker Oats Co. working in technical service and applications research on thermosetting resins.

## U.S. Plywood Expanding

More than $11 million will be spent by the U.S. Plywood Co. to modernize and expand the facilities of its nationwide distribution system. According to Gene C. Brewer, president of the company, U.S. Plywood is eyeing with considerable interest the farm building market. He estimates that about 48 per cent of existing farm buildings will have to be replaced within the next 20 years, and this means a potential market of $720 million for partially prefabricated buildings of fir plywood.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## Laminating Resin Offered

A low loss, high temperature laminating resin called Eccomold L-70 is available from Emerson & Cuming, Inc., Canton, Mass. The resin is said to produce laminates capable of withstanding temperatures of 500°F. when used in conjunction with quartz or fiber glass fabric. When used with polypropylene fabric, Eccomold L-70 produces low dielectric constant laminates which have a dielectric constant of K2.15 and a dissipation factor of 0.0008. The company says that the laminates are suitable for use in radomes, printed circuit boards, waveguide windows, antenna insulators and other critical electronic applications. The laminating resin is a one-component material and does not require the addition of a catalyst. It is supplied at a viscosity which is said to assure thorough wetting of the fabric.

## 3M Merger Called Off

Minnesota Mining & Manufacturing Co. and Warner-Lambert Pharmaceutical Co. have called off negotiations to merge the two firms after failing to secure definite approval from the United States Department of Justice. Merger talks between the two companies began on August 22, 1960, and were suspended on December 14 pending clearance by the Justice Department. It has been speculated that the Government's failure to approve the merger plan meant that it would have opposed the plan in the courts.

## Synthetic Fabrics Package

Synthetic Fabrics, Inc., Springfield, Mass., has developed a new package to improve the appearance of its rolls of self-adhering decorative vinyls. The company is packaging every 25-yard roll of its self-adhering vinyls — Magic-Cover, Magic-Counter-Cover, and Magic-Lustre Cover — in a plastic bag with one end sealed and the other end tucked into the core of the roll. According to the company, the new plastic bag is intended to reduce waste and soilability of its products.

## National Starch Sales Up

Sales at National Starch and Chemical Corp. for the year ended December 31, 1960, were $54,422,732, compared with $52,768,725 for 1959. Net income was $3,242,068, the equivalent of $1.58 per share of common stock, as against $337,150, or $1.64 per share, for the previous year. Earnings in 1959 included a non-recurring credit of 12¢ per share arising from adjustment of excess accruals.

## Urea Plant Opens

Consolidated Mining & Smelting Co. of Canada, Ltd., has started production at its new $5 million urea plant at Calgary, Alberta, Canada. The plant, which utilizes natural gas for its raw material, has a rated capacity of 100 tons of urea per day. It is located adjacent to the company's Alberta Nitrogen Department.

## Swift Building Addition

The Technical Department of Swift & Co. has started construction of an addition to its epoxidation plant in Hammond, Ind., which will add 8 million pounds per year to its present capacity. The addition is expected to go on stream during 1961.

## OBITUARIES

### *Raymond E. Wirth*

Raymond E. Wirth, a member of the executive staff of Rilco Laminated Products, a division of Weyerhaeuser Co., died on January 18, 1961, in St. Paul, Minn. Mr. Wirth received his B.A. degree from Morningside College, Sioux City, Iowa. He has been with Rilco since 1942. A member of the American Institute of Timber Construction's Technical Committee, Mr. Wirth also was the author of the article "Evaluation and Control Tests for Structural Wood Laminates", which appeared in the March, 1961 issue of *Adhesives Age*.

## Bradco Epoxy Coating

Bradco Plastics Co., Houston, Texas, has developed a new epoxy protective coating called PlastXcoat which can be sprayed, rolled or brushed onto any type of surface under all weather conditions. According to Bradco, this is the first self-priming epoxy-based coating to be perfected for a wide variety of applications. PlastXcoat has been applied to wood, plastic, concrete, brick, glass, aluminum, and hard-to-paint transites and exotic metals. The new coating is said to withstand temperatures ranging from —73° to 250°F., and contains a built-in plastic "membrane" which eliminates the need for extra coatings. Additional advantages listed are resistance to moisture, salt water and corrosive liquids and gases, longer pot life, and resistance to chipping, cracking, and peeling.

## Armour Names Executives

The board of directors of Armour and Co., Chicago, Ill., has elected Edward W. Wilson as president of the company, and William Wood Prince as chairman of the board and chief executive officer. Mr. Wilson has served with the company since 1917 and has held a number of management assignments. Most recently he served as executive vice-president of Armour Chemical Industries, and is credited with being chiefly responsible for its development. Mr. Prince had been president and chief executive officer of the company since 1957.

## Permacel Patent Exhibit

Permacel, New Brunswick, N.J., participated in a Patent Exhibit sponsored by the Patent Office of the United States Department of Commerce, held on February 13 to March 10 in the Department of Commerce Building Lobby in Washington, D.C. The exhibit was established to show the many technological advances in the chemical and synthetics field under the American patent system. The Permacel display featured products manufactured under three of the 84 patents which the firm now holds.

Wayne Wheelhouse

## Joins Bemis Staff

Wayne Wheelhouse, an adhesives specialist, has been added to the staff of the General Engineering Department of Bemis Bros. Bag. Co., St. Louis, Mo. Mr. Wheelhouse will investigate adhesive problems, coordinate activities in all Bemis plants, and concentrate on ways of improving methods and cutting costs. A graduate of the University of Illinois with a degree in chemistry, Mr. Wheelhouse has also taken graduate work in chemical engineering and paper chemistry. Prior to joining Bemis as adhesive control supervisor, he was technical and development director of the Sefton Fibre Can Division of the Container Corp. of America, St. Louis, Mo.

## Opens Overseas Facility

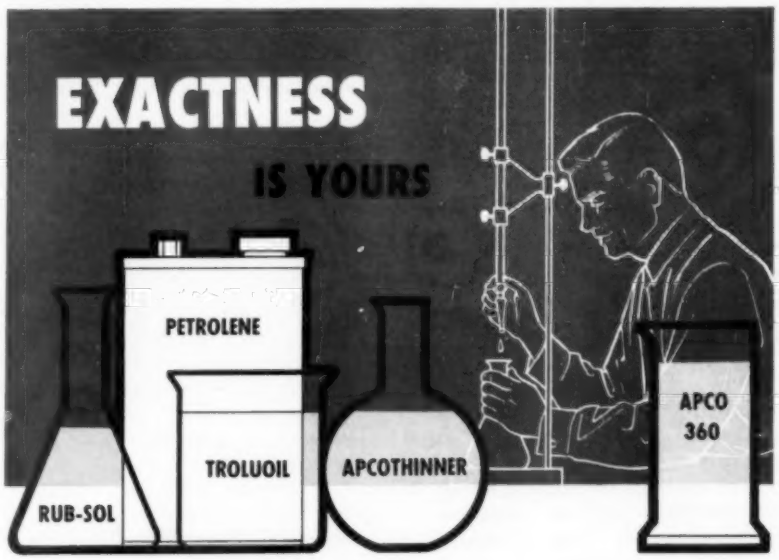
The Overseas Chemical Division of W. R. Grace & Co., Cambridge, Mass., has opened a new unit at Santa Clara, Mexico, which will make container sealing compounds. The plant currently is producing sealing compounds for tin cans only, but is being equipped to make compounds for glass closures and other types of containers, the company states.

## M-P Names McNerney

The Adhesives Division of Morningstar-Paisley, Inc., has appointed Tom McNerney as its sales representative in Indiana, Ohio, and Kentucky. Mr. McNerney has been associated with the adhesives industry for several years.

## Ciba Curing Agent

An improved curing agent for solventless coating systems is being offered by Ciba Products Corp., Fair Lawn, N.J. The curing agent, Araldite DP-121A, when used in combination with low viscosity epoxy resins produces coating systems that can be applied in single-coat, dry-film thicknesses of 5 to 10 mils, the company states. It is claimed that DP-121A epoxy systems have longer pot lives than previous solventless epoxy systems. Finishes produced from these systems cure at room temperatures to hard, tough, flexible films with a high gloss and good chemical resistance. Flow control agents are said to be unnecessary, and systems using Araldite DP-121A show improved levelling and gloss, eliminating pigment flocculation problems.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## Adhesives Conference Planned by BRI

A program on Adhesives and Sealants has been scheduled by the Building Research Institute for its 1961 Spring Conferences, to be held on May 16 to 18 at the Shoreham Hotel in Washington, D.C. George J. Schulte (Minnesota Mining), chairman of the Planning Committee, reports that the Adhesives and Sealants Conference will be held in three separate sessions.

Leslie M. Jackson (Tremco) will be chairman of the first session on "Requirements for Weatherproofing Thin Shell Concrete Roofs." Topics to be discussed are: "Requirements for Weatherproofing and Sealant Materials" by Owen L. Delevante (Harrison & Abramovitz); "Effect of Physical Factors on Weatherproofing" by Prof. C. E. Lund (University of Minnesota); "Problems and Limitations, and their Effects on Weatherproofing and Sealant Materials" by R. E. Yeakel (Eero Saarinen); "Properties and Uses of Available Weatherproofing and Sealant Materials" by Frank Scofield (National Paint, Varnish & Lacquer). A "Report" on conclusions reached during the workshop will be presented by Nembhard N. Culin (Frederick G. Frost) and Francis L. Frybergh (Skidmore, Owens & Merrill).

***Tape Session***

Richard G. Breeden, Jr., (Pressure-Sensitive Tape Council), is chairman of the second session which will cover "Pressure-Sensitive Tapes for Buildings." Topics to be discussed are "Application of Pressure-Sensitive Tapes in the Building Industry" by D. A. Wallace (Permacel) and "Recent Field History of Pressure-Sensitive Tapes for Sealing Applications" by P. H. Wilson (Minnesota Mining).

The third session, on "Selection and Application of Adhesives in the Field", with D. Kenneth Sargent (Syracuse University) as session chairman, will include the following topics: "Adhesives for Ceramic, Plastic and Metal Tile" by Alex O'Hare (Miracle Adhesives); "Adhesives for Wallboard" by R. E. Parry (Johns-Manville); "Adhesives for Resilient Floor Covering" by C. L. Carlson (Armstrong Cork); "Adhesives for Insulation" by Wayne Ellis (Benjamin Foster); "Adhesives for Plastic Laminates" by George J. Schulte (Minnesota Mining); "Adhesives for Acoustical Tile" by Francis S. Branin (Asco Products), and "Adhesives for New Field Applications" by J. L. Been (Rubber and Asbestos).

Irving Bederson

## Anchor Adhesives Official

Anchor Adhesives Corp., New York, N.Y., has appointed Irving Bederson as vice-president of sales. Mr. Bederson has served in the adhesives field for the past 20 years. He pioneered Anchor's Sales Department in 1951, when the company was founded. In a statement made after his appointment, Mr. Bederson announced that the company is establishing technical sales offices in various parts of the country in order to provide better customer service.

## Record Year for Borden

The Borden Co. reports that its sales and earnings for 1960 set new record highs. Earnings were up 5.1 per cent with a figure of $26,856,250, equal to $2.71 per share, compared with the 1959 figure of $25,548,693, or $2.61 per share. Sales in 1960 totaled $956,014,030, about a 1.6 per cent rise over the 1959 volume of $941,326,495. The per share figures are adjusted to reflect the two-for-one stock split made by the company in January, 1960.

## Allied Melamine Unit

A new chemical facility, which will produce over 20 million pounds per year of melamine resin, is being planned by Allied Chemical Corp. The site for the facility has not yet been selected. The company's Nitrogen Division will supply the crystal to the Plastics Division, which makes melamine molding resins. Allied Chemical has a license on basic production patents from American Cyanamid Co., but says it will use its own urea-based process, which it has been developing for the past 20 years. This is not the biuret process which Allied patented in 1953. Last year, Allied doubled the capacity of its big resin unit at Toledo, Ohio, at a cost of about $8 million. Until its new melamine unit goes into production, Allied will continue to purchase its supply of melamine crystal from American Cyanamid.

## Mexican Adhesives Group

The National Association of Adhesive Manufacturers of Mexico has been formed under the name of Asociacion Nacional de Fabricantes de Pegamentos, A.C. with headquarters in Havre, Mexico. Officials of the group are: *President*, Rodolfo Patron (Adhesivos Resistol); *Vice-President*, Moises Zukerman (Productos Especializados de Hule); *Treasurer*, Jorge Ademe (Minnesota Manufacturera de Mexico); *Secretary*, Rene D. Galindo. The new association will serve as a consulting group on the adhesive market in Mexico.

## New Carborundum Unit

A new coated abrasive manufacturing plant will be constructed in Melbourne, Australia, by the Carborundum Co., Niagara Falls, N.Y. The new unit is designed to meet the growing demand for coated abrasives in Australia and New Zealand. When the plant is completed, late in 1961, Carborundum Australasia Pty., Ltd., a Carborundum subsidiary, will transfer its manufacturing operations from its Sydney, Australia, plant to the new Melbourne facility.

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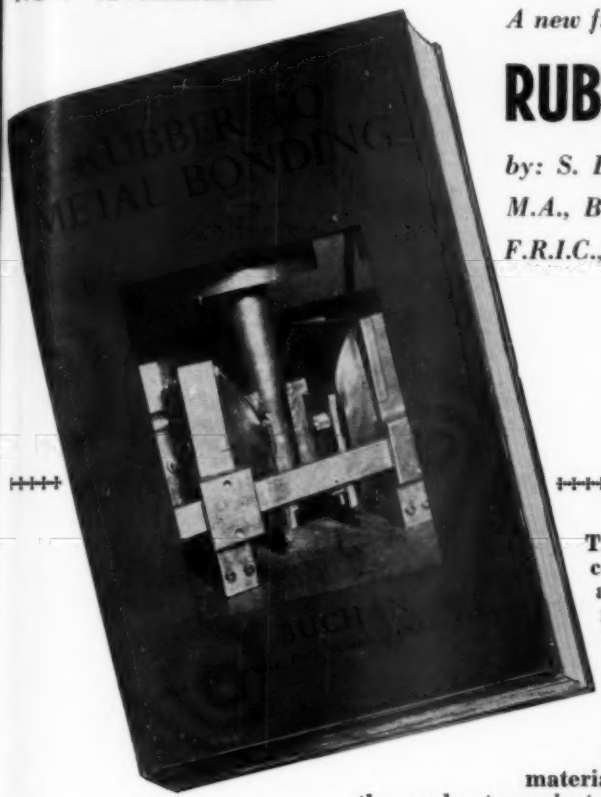


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## SMA Resins Marketed

A new family of low molecular weight styrene-maleic anhydride resins, said to give improved adhesion in a variety of chemical reactions and applications, has been put into semi-commercial production by the Texas Butadiene & Chemical Corp. at its new facility in South Miami, Fla. The resins are being marketed under the trade name SMA, and the Florida plant will produce one million pounds annually. According to the company, the first member of the SMA resin family is a copolymer with a molecular weight of about 1600. Derivatives of this resin have varying degrees of esterification and varying properties. In anhydrous form, the SMA resins are white, free-flowing powders with melting points ranging from 95° to 165°C. and acid numbers ranging from 186 to 500. Ammonium hydroxide solutions of these resins are also available.

## Neville Appoints Agent

Neville Chemical Co., Pittsburgh, Penna., has appointed Smith Chemical and Color Co., New York, N.Y., as its sales representative in metropolitan New York and northern New Jersey. Neville resins and solvents will continue to be stocked in New York to assure prompt delivery to customers. Donald L. Marsh, located at 1557 W. Sixth St., Plainfield, N.J., will continue to be available for consultation on technical matters concerning Neville chemicals. Smith Chemical also represents such firms as Olin Mathieson Chemical Corp., Georgia Marble Co., Union Bag-Camp Paper Corp., and Northern Pigment, Ltd.

## FTC Charges A-M

The American-Marietta Co. has been charged by the Federal Trade Commission that nearly 50 of its acquisitions violate antimerger laws. The FTC complaint states that A-M's acquisitions may result in a substantial lessening of competition or a tendency to create a monopoly in various sections of the country. Robert E. Pflaumer, president of A-M, reports that the company is prepared to prove that none of its acquisitions has had the effect cited by the FTC.

George Browder

## Named by National Starch

George Browder has joined the engineering sales staff of National Starch and Chemical Corp. He will be engaged in development of sales of the Instant-Lok System of adhesion, working out of the New York office. Mr. Browder formerly was associated with the Allison Division of General Motors Corp., and was eastern sales manager of packaging equipment for the Lynch Corp. Prior to joining National Starch, he conducted his own business in the design, manufacture and sale of special machinery for flexible packaging. According to the company, Mr. Browder brings broad experience in the sale and service of packaging equipment to the National organization.

## New Dow Chemical Resin

A new epoxy resin said to have a high viscosity in the range of 500,000 cps has been developed by the Dow Chemical Co., Midland, Mich. Called Experimental Resin X-2638.6, it is available only as an 85 per cent solution in methyl ethyl ketone. This is for handling ease, the company reports. The high viscosity of this resin, the company states, permits the production of prepreg fabric without the need for carefully controlled B-staging. In addition, matched-die molding under heavy pressures is possible without excessive resin flow-out. Prepreg tack is so slight, the company reports, that fabric webs can often be rolled and stored without an interleaving release film. A range of viscosities is provided in blends of Experimental Resin X-2638.6 with D.E.N. 438 and conventional epoxy resins. The new resin is available in multi-drum quantities.

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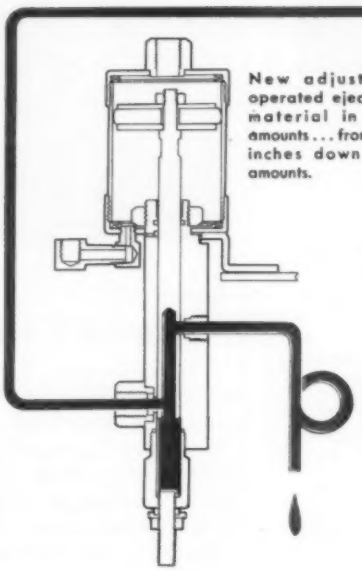
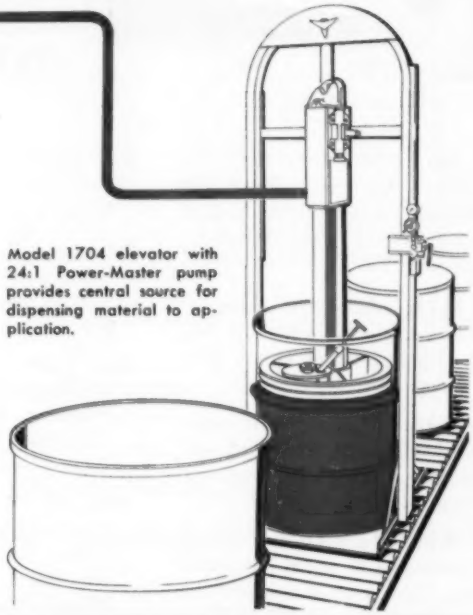


New adjustable air-operated ejectors deliver material in measured amounts... from 0.2 cubic inches down to minute amounts.



Model 1704 elevator with 24:1 Power-Master pump provides central source for dispensing material to application.

# New technique...welding with adhesives

| PUMP DESIGN | AIRMOTOR SIZE | 2" ONE THIRD THE POWER OF THE 4" | 3" ONE HALF THE POWER OF THE 4" | 4" | 6" TWICE THE POWER OF THE 4" |
|---|---|---|---|---|---|
| SHOVEL TYPE THREE SIZES | A | 25··1 | 37··1 | 75··1 | ···· |
| | B | 13··1 | 20··1 | 40··1 | 80··1 |
| | C | 8 ··1 | 12 ··1 | 24··1 | 48··1 |
| BALL TYPE TWO SIZES | D | 4 ··1 | 6 ··1 | 12 ··1 | 24··1 |
| | E | 1.3··1 | 2 ··1 | 4 ··1 | 8 ··1 |

Major automobile manufacturers now "weld" with adhesives . . . join hood and trunk assemblies with measured daubs of thermosetting mastics that adhere strongly to metal and won't slump during paint bake exposure. The "adhesive welds" save weight, prevent surface dimples caused by electric welds, absorb vibrations, and eliminate the need for asphaltic paper or other sound deadeners.

Lincoln offers complete versatility in materials dispensing equipment as shown in the pump chart at left. Simply by changing air motors or pump tubes, you get pressure ratios from 1.3:1 to 80:1. You can dispense precise amounts from gallons to ounces with Lincoln equipment.

Investigate how you can improve your production use of materials with Lincoln dispensing systems.

LINCOLN ENGINEERING COMPANY
Dept. AA-4
4010 Goodfellow Blvd.
St. Louis 20, Mo.
☐ Send literature on materials dispensing equipment
☐ Have local man call to discuss dispensing systems
Name _____ Title _____
Company _____
Street _____
City _____ Zone ____ State _____

*Industry's widest selection of materials dispensing equipment: Air-operated pumps • Measuring valves • Pressure primers • Airless spray equipment • Hose • Couplings • Air compressors • Filters • Regulators*

LINCOLN ST. LOUIS

LINCOLN
ENGINEERING COMPANY
ST. LOUIS 20, MO. • DIVISION OF THE McNEIL MACHINE & ENGINEERING CO.

**April 4-6.** Research and Development Associates, Food and Container Institute, 15th Annual Meeting, Hotel John Marshall, Richmond, Va.

**April 9-13.** American Association of Cereal Chemists, 46th Annual Meeting, Baker Hotel, Dallas, Texas.

**April 9-13.** American Management Association, 30th National Packaging Exposition, Lakefront Exposition Hall, Chicago, Ill.

**April 9-15.** National Association of Architectural Metal Manufacturers, 23rd Annual Convention, Plaza Hotel, New York, N.Y.

**April 10-11.** American Society of Mechanical Engineers, Maintenance & Plant Engineering Conference, Hotel Bancroft, Worcester, Mass.

**April 10-12.** ASTM Committee D-11 on Shipping Containers, Chicago, Ill.

**April 18-20.** Stanford Research Institute, Symposium on Chemical Reactions in the Lower and Upper Atmospheres, Mark Hopkins Hotel, San Francisco, Calif.

**April 20-21.** Society of the Plastics Industry, 18th Annual Western Section Conference, Hotel Del Coronado, Coronado, Calif.

**April 23-26.** American Society of Mechanical Engineers, Metal Engineering Conference, Penn Sheraton Hotel, Pittsburgh, Penna.

**April 23-27.** American Ceramic Society, 63rd Annual Meeting, Royal York Hotel, Toronto, Ontario, Canada.

**April 30-May 9.** German Industries Fair, Hanover, West Germany.

**May 2-9.** Sixth International Packaging Show, R. A. Exhibition Building, Amsterdam, The Netherlands.

**May 3-13.** U. S. World Trade Fair, New York Coliseum, New York, N.Y.

**May 4-6.** National Paper Box Manufacturers Association, Annual Convention, Washington, D.C.

**May 7-10.** American Institute of Chemical Engineers and the Chemical Engineering Division, Chemical Institute of Canada, Joint Meeting, Cleveland, Ohio.

**May 8-9.** Society of the Plastics Industry, 19th Annual Canadian Section Conference, Sheraton-Brock Hotel, Niagara Falls, Ontario, Canada.

**May 8-10.** Technical Association of the Pulp and Paper Industry, 12th Coating Conference, Statler Hilton Hotel, Buffalo, N.Y.

**May 9-11.** Materials Handling Institute, National Industrial Packaging & Handling Exposition, Philadelphia, Penna.

**May 10-12.** American Institute of Chemists, Statler Hilton Hotel, Washington, D.C.

**May 10-12.** American Society of Mechanical Engineers, Production Engineering Conference, Royal York Hotel, Toronto, Ontario, Canada.

**May 11-13.** American Institute of Industrial Engineers, 12th Annual National Conference and Convention, Sheraton Cadillac Hotel, Detroit, Mich.

**May 14-16.** National Fibre Can and Tube Association, 28th Annual Meeting, Francis Marion Hotel, Charleston, S.C.

**May 15-17.** Chemical Specialties Manufacturers Association, 47th Midyear Meeting, Drake Hotel, Chicago, Ill.

**May 16-18.** Building Research Institute, Spring Conferences, Shoreham Hotel, Washington, D.C.

*Portrait Of*

## MAGNUS L. SELBO

An internationally known authority on glued wood lamination, Magnus Leonard Selbo has headed a section on glued laminated products much of his 18 years at the U.S. Forest Products Laboratory, Madison, Wisc. He has developed test methods used for both research and production quality control. His pioneering work on curing resorcinol adhesives showed that as the temperature increases in a linear ratio, time decreases logarithmically.

Mr. Selbo is co-author of "Fabrication and Design of Glued Laminated Wood Structural Members," a USDA Technical Bulletin widely used as a source of basic information.

A native of Norway, Mr. Selbo is a chemical engineering graduate of the University of Washington. Before he joined the FPL, he was with the Associated Plywood Mills, Eugene, Ore., and Balfour, Guthrie and Co., Ltd., Tacoma, Washington.

During the academic year of 1955-56, Mr. Selbo was a Fulbright research scholar at the Norwegian Institute of Wood Technology at Oslo, and assisted in organizing a division on gluing and laminating there. A good deal of Mr. Selbo's work at the FPL has been with the U.S. Navy in the development of gluing processes for laminated keels, frames, and other parts of wood ships and boats. In 1955, he visited several European countries as a consultant to marine laminators.

## Doubles Resin Capacity

The Molded Fiber Glass Companies has doubled the capacity of its polyester resin plant at Ashtabula, Ohio. The newly-completed facilities for the production of isophthalic-based resins increases the plant's capacity from 5 million to 10 million pounds annually. Total output of the unit will go to the firm's five affiliated companies. Quality control and resin development work will be handled at the new unit by the associated Molded Fiber Glass Research Co.

## Bemis Sales Top 1959

According to a preliminary report from the Bemis Bro. Bag Co., St. Louis, Mo., sales for 1960 were $131,651,312, slightly above the $131,251,156 total of 1959. Net income totaled $2,869,328, a drop of 5 per cent from the $3,023,354 reported the year before. Earnings per share of common stock amounted to $4.03 in 1960, as against $4.24 in 1959.

## Heyden Plans Epoxy Line

Heyden Newport Chemical Corp., New York, N.Y., is planning to add a line of epoxy chemicals to its specialty product program. According to the disclosure, initially the line will include liquid and resinous curing agents for epoxies, and viscosity modifiers. Other products will be added later. Production will emanate from the Heyden Chemical Division plant in Garfield, N.J.

"We've been getting complaints on our new adhesive flavors — It seems people have been eating the flaps."

## New Avery Materials

MH and Flex, two new impregnated materials, are being offered by Avery Label Co., Monrovia, Calif., as stock for pressure-sensitive labels. MH is a heavy-duty material which is said to be both flexible and tough, with excellent resistance to water, grease, soap, and dilute acids. When combined with Perma-Grip adhesives, MH is also said to withstand high temperatures. The company is offering MH stock in combination with other Avery adhesives for laboratory labels, outdoor signs and other heavy-duty applications where heat is not a factor. Flex is a limp, durable label paper, somewhat less effective than MH stock in resisting water, grease, soap, and dilute acids, but Avery states that it is better in these respects than other label papers and, in addition, offers superior resistance to heat.


## *For More Information*

**about the products and services described in this issue**

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4¢ STAMP

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**101 West 31st Street**
**New York 1, N. Y.**

**— fasten along this edge —**

## Staley Overseas Staff

A. E. Staley Manufacturing Co., Decatur, Ill., has renamed its Export Division to the Overseas Division, in line with the company's expanding overseas interests. Earl M. Bailey, export manager for many years, continues as head of the Overseas Division, with responsibility for management and liaison in all of Staley's overseas operations. John R. Shroyer, formerly assistant export manager, has been promoted to export sales manager within the new division. David A. Gullette, formerly chemical sales supervisor, has been named European area manager at Fribourg, Switzerland. The appointment was made by the company's wholly-owned Swiss subsidiary, Staley, A.-G. Mr. Gullette will coordinate the Swiss company's activities with those of Staley (London) Ltd., and Staley interests in jointly-owned companies in Europe.


## For More Information

**about the products and services described in this issue**

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**simply mark, clip coupon, fold, fasten and mail**

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- **Circle the items on which you want more information.**
- **Fill in name, address and all other information requested to insure service.**
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**Clip coupon—fold along this line—tape or staple edges—stamp and mail**

**This card valid until May 31, 1961** **4**

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**New Literature:** L-351 L-352 L-353 L-354 L-355 L-356 L-357 L-358 L-359

**New Products:** P-472 P-473 P-474 P-475 P-476 P-477 P-478 P-479 P-480 P-481 P-482 P-483

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**Name** ..... **Title** .....

**Company Name** .....

**Company's Products** .....

**Address** .....

**City** ..... **Zone** .... **State** .....

**— Tape or staple along this edge —**


## Rubba Offers Adhesive

Rubbatex is a new polyethylene adhesive used in the manufacture of multi-wall shipping sacks which utilize high quality polyethylene and paper. It is available from Rubba, Inc., New York, N.Y. Rubbatex can be used to spot-cement an intermediate ply of sheet polyethylene, at top and bottom, to adjacent layers of heavy-duty kraft paper. Like polyethylene, the new adhesive is resistant to moisture, remains flexible at low temperatures and, according to Rubba, is even more resistant than polyethylene at high temperatures. In addition, the adhesive is unaffected by acids or alkalies and has excellent aging qualities. The company adds that Rubbatex is also excellent for adhering labels, gummed and ungummed, directly to polyethylene.

## Promoted by Staley

Alan R. Kimbell, formerly with the St. Louis branch office of A. E. Staley Manufacturing Co., Decatur, Ill., has been promoted to assistant manager of the firm's Atlanta, Ga., branch office. A graduate of Middlebury College, Mr. Kimbell joined Staley in 1955 as an industrial sales trainee, and was assigned to the St. Louis branch office in 1956.

## Adhesion Conference

The Gordon Research Conference on Adhesion will be held on August 28 to September 1, 1961, at the New Hampton School, New Hampton, N.H.

**"Well, then, perhaps we could state that it is a modified epoxy resin, curing at room temperature, with an asterisk denoting that the room must be heated to 275°F."**

# names in the news

*Peter P. Wojtul*, vice-president of Continental Can Co., New York, N.Y., has also become general manager of the firm's boxboard, folding carton, and fiber drum operations.

*George Biner*, one of the founders of the Biner-Ellison Machinery Co., Los Angeles, Calif., has retired and sold his interest in the firm to *Tom Ellison*, president of the company.

*Samuel J. Charles, Jr.*, has been appointed vice-president and general manager of the Armstrong Panam Corp., under the International Marketing Division of Armstrong Cork Co., Lancaster, Penna.

*William N. Davies* has been elected vice-president of sales for Interchemical Corp., New York, N.Y.

*J. C. Mulholland* has been named manager of the National Sales Department of the Packaging Corp. of America, Evanston, Ill.

*Philip A. Thomas* has been appointed assistant director of development for Union Carbide Plastics Co., New York, N.Y.

*A. B. Clunan*, chief of the Flexible Packaging Branch of the Containers & Packaging Division of the United States Department of Commerce, has been awarded an honorary citation by the National Flexible Packaging Association "for outstanding cooperation with the packaging industry."

*A. H. McKinlay*, of the General Electric Co., Schenectady, N.Y., has been elected chairman of the Industry Advisory Committee on Corrugated Container Research of the U.S. Forest Products Laboratory.

*Richard C. Breiner*, previously with Johns-Manville Corp., has joined Nicolet Industries, Inc., Florham Park, N.J., as project director.

*Albert L. Munsell* has been promoted to general sales manager for Formica Corp., Cincinnati, Ohio.

*Dr. Ronald O. Ragsdale* has joined the General Chemical Division of Allied Chemical Corp., Morristown, N.J., as a research chemist.

*Ernest H. Schroeder*, product sales manager for Reichhold Chemicals, Inc., White Plains, N.Y., has been named group leader of a newly-formed adhesive product group.

*C. Duane Coates*, previously with Escanaba Paper Co., has joined the Mead Corp., Chillicothe, Ohio, as technical director.

*Henry O. Ehrisman* has been named vice-president and general sales manager of the Foxboro Co., Foxboro, Mass.

*Jerome Kronfield*, formerly with National Starch Products, Inc., has joined Permacel, New Brunswick, N.J., as a product engineer.

*Allan M. Mulder*, previously with Allied Paper Co., has become a sales representative for the Ciba Co., Kalamazoo, Mich.

*Neal M. Draper* has been named vice-president of the National Aniline Division of Allied Chemical Corp., New York, N.Y.

*Raymond L. Mayhew* has been appointed manager of technical service and development for the Antara Chemicals Division of General Aniline & Film Corp., New York, N.Y.

*David M. Jacks* and *Thomas G. Cocks* have been named vice-presidents of the Nalco Chemical Co., Chicago, Ill.

*Roy E. Shay*, formerly labor relations supervisor at A. E. Staley Manufacturing Co., Decatur, Ill., has been named to the newly-created position of assistant plant superintendent. He is succeeded by

*R. Bruce Baptie* has been appointed sales manager of the Carwin Co., North Haven, Conn.

*George B. Mosely* has been appointed vice-president of marketing for Celanese Corp. of America, New York, N.Y.

*Stuart L. Brown, Jr.*, has been named director of plastic research in the Packaging Research Division of Reynolds Metal Co., Richmond, Virginia.

*H. C. Lavely* has been named sales manager of plastics application in the Plastics Division of the Koppers Co., Pittsburgh, Penna.

*James D. Floria* has been appointed director of design for the newly-formed Product Design, Styling, and Packaging Department of the B. F. Goodrich Co., Akron, Ohio.

*John W. Pool, Jr.*, previously sales manager of the Plastics Division of the Koppers Co., Chicago, Ill., has been appointed vice-president of the division.

*H. R. Calderwood* has been appointed sales representative in the Western Ontario area for Industrial Adhesives, Ltd., with headquarters in London, Ontario, Canada.

*John C. Becker, Jr.* has been named technical service manager of the Poylco Monomer Department of the Borden Chemical Co., Leominster, Mass.

*Dr. Bernard Ackerman* has been appointed director of laboratories at Advance Solvents & Chemical Co., New Brunswick, N.J.

*Wayne H. Clum* has been appointed technical sales representative for the H. B. Fuller Co. in the Greater Cincinnati (Ohio) area.

*Ward Mayer*, chairman of the board of Timber Structures, Inc., Portland, Ore., has been elected chairman of the National Wood Council.

*Dale L. Gaeth* has been named vice-president and manager of the Rilco Division of the Weyerhaeuser Co., St. Paul, Minn., succeeding *J. P. Weyerhaeuser, III*, who recently assumed management of the firm's new Roddis Division in Marshfield, Wisconsin.

By MELVIN NORD

## Apparatus for Applying Patches to a Moving Web

U.S. Patent 2,958,437, issued November 1, 1960 to Albin J. Mengis and assigned to Wolf Brothers, Inc., describes a method and apparatus for applying finger opening reinforcing patches to a web of material which is to be folded and formed into a succession of bags.

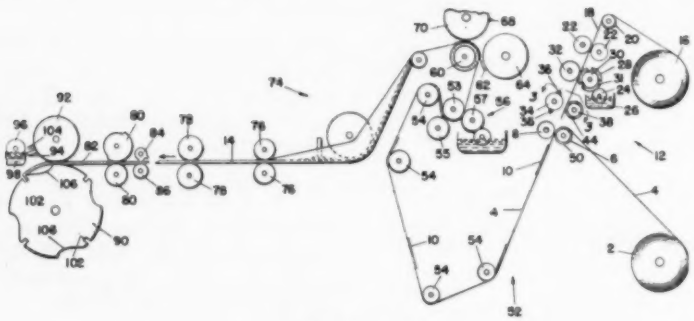


Figure 1

In the manufacture of paper bags, it is a well known practice to form a moving web of paper into a succession of bags having one open end and adjacent openings for the passage of the fingers of a person carrying the bag. Such bags are commonly provided with a patch of reinforcing material surrounding the finger openings in order to prevent this area from tearing.

In the application of patches to the moving web during the manufacture of bags of this type, difficulty is encountered in properly positioning the reinforcing patches. This is due to a non-uniformity of indexing or placement of the patches which results in the reinforcing patches either extending beyond the open end of the bag or being spaced too great a distance from the open end of the bag. In view of the fact that successive bags are severed from the moving web with a high degree of accuracy of bag length, it is evident that the difficulty is caused by non-uniformity of patch placement.

It has been found that this difficulty arises when adhesive is applied to the bag web and the patch is immediately thereafter applied to the adhesive-coated area. Under these conditions the adhesive material is soft and fluid at the time the patch is applied to the bag web and acts as a lubricant making it extremely difficult to hold the patch unmoved from the precise position at which it originally engages the web.

On the other hand, if adhesive material is applied to the ribbon of patch material prior to the cutting of patches from it and prior to the application of the cut patches to the web of bag material, the difficulty is avoided by providing sufficient elapsed time between the application of the adhesive to the patch ribbon and the application of each severed patch to the bag web.

It has also been found that if the patch adhesive is applied in spaced stripes, the tendency for the patch to shift its position after application to the web is greatly reduced.

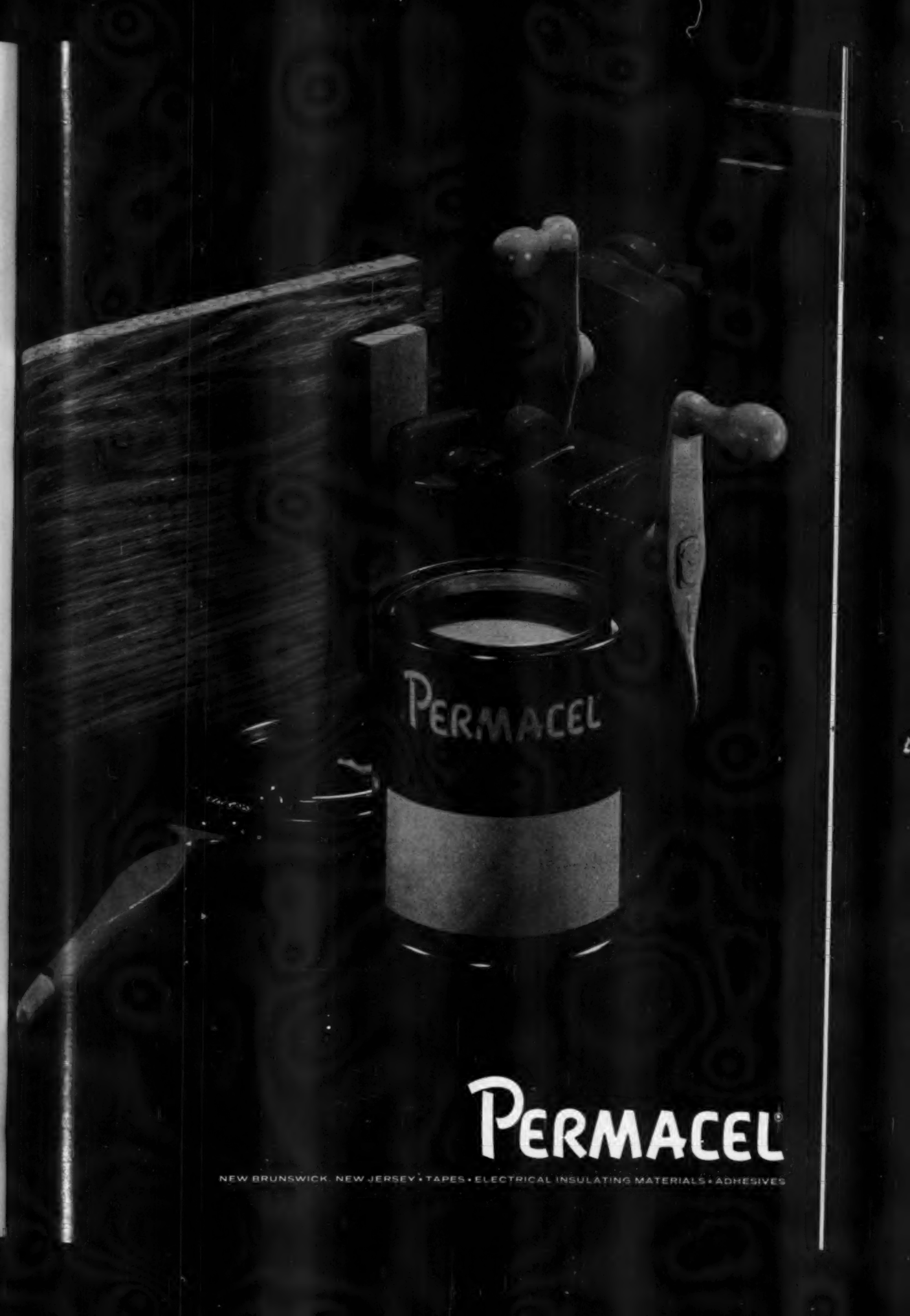
Figure 1 shows the apparatus used to accomplish these results: The bag web (4) is taken from roll (2), and adhesive-coated patches (10) are placed on the web at the rolls (6 and 8) by apparatus (12) which includes a roll of patch material (16), an adhesive pick-up roller (24) in an adhesive bath, a grooved roller (30) which places the adhesive on the patch ribbon (18) in interrupted stripes, and a cutting roller (34). The driven rollers (6 and 8) are positioned exactly one patch length from the cutter roller (34) and as the patch leaves the roller (34) its free end is engaged between the driven roller (8) and the bag web and is positioned on the bag web (4). It will be evident that the adhesive coating on the severed patch (10) has by this time become sufficiently dried or stiffened to seize and adhere securely to the bag web. This condition in conjunction with the striped application of patch adhesive will result in there being very little possibility of the patch shifting as it is carried along with the bag web (4) after the bag web leaves the rollers (6 and 8).

## Butyl Rubber to Cuprous Metal

U.S. Patent 2,960,426, issued November 15, 1960 to Joseph F. O'Mahoney, Jr., and assigned to United States Rubber Co., describes a method for adhering butyl rubber to cuprous metal such as bronze or brass plated wire.

It has been found that if butyl rubber is compounded with a 2,6-dimethylol-4-hydrocarbyl phenol and sulfur, and thereafter subjected to vulcanizing conditions in contact with a cuprous metal body, such as a tire bead wire, the butyl rubber adheres to the wire with remarkable tenacity. This is a noteworthy result, in view of the fact that butyl rubber compounded with a 2,6-dimethylol-4-hydrocarbyl phenol in the absence of sulfur normally results in adhesion that is so negligible that the metal may be separated from the butyl rubber by easy hand manipulation.

The reaction is unusual since sulfur curing butyl rubber stocks and resin curing butyl rubber stocks are so incompatible as to permit no appreciable quantity of one kind of stock to be vulcanized with the other. Normally the one vulcanizing

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system seems to poison or inhibit the other to such an extent that each must not be mixed with the other. It has been found that the use of any organic accelerator of sulfur-vulcanization somehow "poisons" the adhesive system and must be avoided. Reinforcing materials

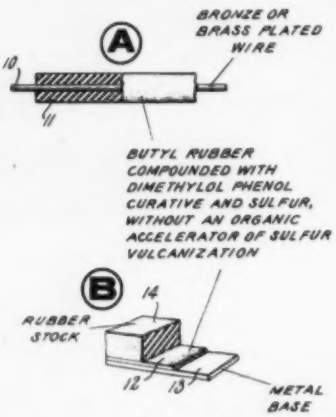



**Figure 2**

or fillers may be used, however, as well as processing aids, antioxidants, softeners, and tackifiers.

The vulcanizable butyl rubber mixture, while still in the unreacted state, is applied to the cuprous metal body to which it is desired to adhere the stock. In the case of wire, this is conveniently accomplished by extruding the raw butyl rubber stock, containing the dimethylol phenol curative, sulfur, and other desired ingredients, around the wire in the conventional extrusion machines available for this purpose. Alternatively, the raw butyl rubber stock, compounded as described, may be wrapped around or applied to the wire or other metal body in the form of a previously prepared sheet, made in any convenient manner, such as by calendering the raw butyl rubber stock. The butyl rubber stock itself may be reinforced with fabric, for example, and take the form of a bead wrapping or flipper strip.

In the embodiment of the invention shown in Figure 2a, a butyl rubber stock, compounded as described, is shown as a covering (10), surrounding a wire (11), such as a bead wire.

In the embodiment of the invention shown in Figure 2b, a butyl rubber layer (12), compounded in accordance with the invention, is shown applied to a metal base (13), and a further body (14) of another rubber stock, such as conventionally resin compounded butyl rubber (containing, for example, three to 20 parts of the resin curative), is shown applied over the bonding layer (12) of the invention. In this form of the invention, the butyl rubber layer (12) compounded in accordance with the invention acts as an intermediate adhesive layer for bonding the conventionally resin compounded stock (14) to the metal base (13). The layers (12 and 14) are assembled with the base (13) in an unvulcanized state.

The next essential step is to subject the laminate to vulcanizing conditions. Such vulcanizing conditions may be any of those conventionally employed in vulcanizing rubber goods such as tires, belts, inner tubes, footwear and the like.

### Pressure-Sensitive Tapes

U.S. Patent 2,956,904, issued October 18, 1960 to James O. Hendricks and assigned to Minnesota Mining & Manufacturing Co., describes a process of making rubber-resin type pressure-sensitive adhesive sheeting.

The adhesive layer consists of a polymer which is capable of becoming cross-linked by high-energy electron irradiation. It is irradiated with high-energy electrons to provide a total irradiation dose level of absorption of between one and 20 megareps.

The adhesive layer is at least doubled in cohesive strength, as measured by a hot shear test, without suffering a loss of pressure-sensitive adhesive properties, as a result of the irradiation.

### Gluten and Starch Separation

U.S. Patent 2,961,353, issued November 22, 1960 to Walter A. Carlson and Elliott M. Ziegenfuss and assigned to General Mills, Inc., describes a process for separating wheat gluten and wheat starch from wheat flour.

A dough is formed from the flour and water. The dough is washed with water. The wheat starch is separated from the wash water. The gluten is dried and ground. By adjusting the pH of the dough to 6.4—8.5 by the addition of a basic substance, a relatively stable light-colored gluten may be recovered.

### Cement Compositions

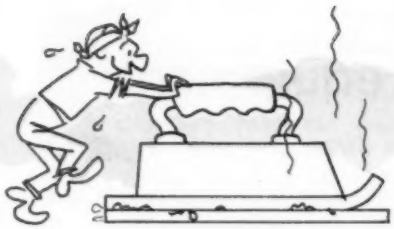
U. S. Patent 2,962,467, issued November 29, 1960 to Herman B. Wagner and assigned to Tile Council of America, Inc., provides a dry cement composition designed to be combined with water. The bulk of the material is Portland cement, to which is added 0.3 to 4.0 per cent of a water soluble metal sulfide, and one to seven per cent of a Bunte salt.

### Other Patents of Interest

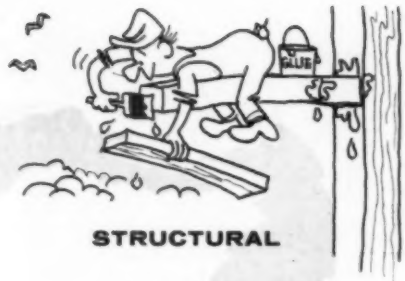
| Subject | Assignee or Inventor | Patent No. | Date |
|---|---|---|---|
| Edge gluer for wood sheets | Masatsugu Minami | 2,961,020 | 11/22/60 |
| Composition for cementing wells | Phillips Petroleum Co. | 2,961,044 | 11/22/60 |
| Free flouring, hydrophobic granular starch | Secretary of Agriculture | 2,961,339 | 11/22/60 |
| Paper sizing agent | Hercules Powder Co. | 2,961,366-7 | 11/22/60 |
| Preparation of inorganic starch esters | Corn Products Co. | 2,961,440 | 11/22/60 |
| Liquid adhesive depositor for shell molds | Shell Process, Inc. | 2,961,946 | 11/29/60 |
| Adhesive composition | American Can Co. | 2,962,468 | 11/29/60 |
| Acrylic modified bonding agent | Rohm & Haas | 2,962,471 | 11/29/60 |
| Belt supported tape dispenser | Mo-Ken, Inc. | 2,963,208 | 12/ 6/60 |
| Pressure sensitive adhesive tape | Johnson & Johnson | 2,963,386-7 | 12/ 6/60 |
| Production of binders for sand cores | Esso Research & Engineering Co. | 2,963,456 | 12/ 6/60 |
| Pressure sensitive adhesive sheet | Johnson & Johnson | 2,964,422 | 12/13/60 |
| Masking paper | Fiore A. Masse | 2,964,438 | 12/13/60 |

**Copies of any patents, including those described here, are available from the Commissioner of Patents, Washington 25, D. C., for 25 cents each. Do not send stamps.**

HOT MELT



HEAT SEAL

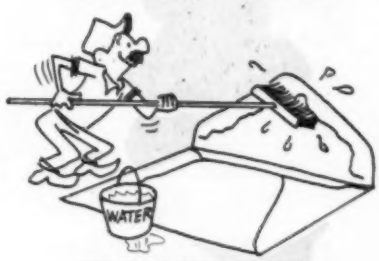



STRUCTURAL

PACKAGING

SOLVENT

GENERAL PURPOSE

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- 12 grades of GELVATOL polyvinyl alcohol resins
- 8 grades of GELVA solid resins and 3 resin solutions
- 2 grades of GELVA polyvinyl acetate spray dried emulsions
- 6 grades of GELVA polyvinyl acetate copolymers
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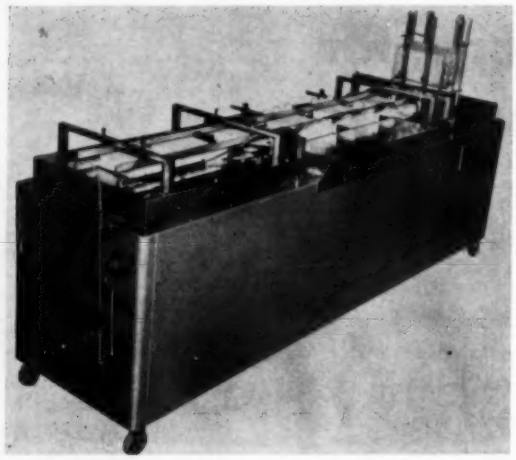
# new equipment

### High-Speed Carton Closer

The King-Tuk is a new high-speed machine designed for erecting and closing end-opening cartons in a horizontal position. The machine is capable of handling cartons ranging in standard size from ½-inch x ½-inch x 3-inch to 12-inch x 4-inch x 12-inch. The King-Tuk features a unique chain drive which incorporates all moving parts for feeding, forming and closing the cartons. A hydraulic vari-drive provides the driving power and allows the operator to control speed —up to 90 cartons per minute. This driving arrangement is said to eliminate braking drift commonly experienced with direct electrical drives or sliding pulleys, and provide full safety against machine damage.

The machine operates on 110-volt, 60-cycle, single-phase electric current. It is made in various models which will erect the cartons and close one end only or pass it through a manual filling station and then close both ends of the filled carton by locking, gluing, or both locking and gluing. Length varies from five feet to 10 feet for models which supply filled, finished packages. Machine change-over time from one carton size to another is reported to take about 30 minutes without need for a mechanic. The King-Tuk is available under lease terms. *Continental Can Co.* **E-298**



### Leak-Proof Paperboard Drum

A series of leakproof paperboard drums with permanent release qualities has been developed for the packaging, shipment and storage of materials which adhere to ordinary containers, are poured at temperatures up to 500°F., and which solidify when they cool. These include adhesives, resins, waxes, and asphalt. An important feature of the drum is its high-tension release coating, Cellu-Kote, which permits filling and emptying an indefinite number of times. Another feature is that drums can be shipped knocked down to reduce warehousing and shipping costs. A special seaming machine assembles the drums at the plant as needed and completely seams the metal bottom to the drum walls. Seams are completely leak proof so that even a hot product cannot seep through. According to the manufacturer, the interior can be specially custom-coated to meet individual release and protective requirements. *The Mead Corp.* **E-299**

### Heat Transfer System

Electric heaters have been designed for the transfer of heat by circulating thermal liquids which are degassed at operating temperatures. Temperatures of these liquids at high velocity are thermostatically controlled. The vertical package units incorporate a dual control system, which takes advantage of the heat transfer temperature differential, and automatically lowers the temperature of circulating thermal liquid when the work being heated has about reached normal temperature. These units were developed for processing plastics, asphalt, rubber, chemicals, paints, varnishes, oils and waxes; for coating paper and fabrics, and for heating coils. Important features of the system are said to be a closed system which prevents hot thermal liquids from coming into contact with air and oxidizing, long service life without cleaning or changing circulating heat transfer liquids, use of circulating heat transfer oil which works at about zero gauge pressure to 650°F., a heater which is hydrostatically tested at 500 p.s.i.g. pressure, degassed thermal liquids for higher thermal conductivity and efficiency, high velocity flow over heater surfaces, minimum heater failures, uniform heating of heated surfaces, and low operating costs. *Gerin Mfg. Co., Inc.* **E-300**

### Miniature Electric Eye

A series of miniature electric eyes has been developed for use in the fields of automation and production, suitable for solving a wide range of problems of inspecting, sorting, counting, web control, registration, level control, and many phases of packaging, from high speed automatic machines to final product monitoring. A series of relay amplifiers has been specifically developed for these electric-eyes. Both the light source and cell may be adjusted to allow accurate, sensitive setting of the trigger point. Light does not have to be completely cut off, since the mechanism can be triggered at percentage of light reduction, size, reflection, or color change. *Photomation, Inc.* **E-301**

### Self-Sealing Latex Applicator

The Lerner Latex Machine LT is a separate machine (not an attachment for folding machines), which applies latex self-sealing adhesives on the extended flaps and body of open-end and commercial

envelopes which have previously been folded on regular envelope machines. The envelopes are delivered ready for packing after application of the adhesive. The unit has been designed, according to the manufacturer, to get the maximum benefit from the wide variety of thermoplastic and self-seal adhesives now on the market. It will also apply latex gum to board or paper sheets, permitting the bonding of one coated surface to another. The unit handles envelopes ranging in size from 3½ by 4 inches to 35 by 24 inches, and permits the running of two different sizes of envelopes at the same time on medium and small sizes. *F. L. Smithe Machine Co.* **E-302**

### Waring Commercial Blendor

A heavy-duty industrial blendor, Model CB-4 is capable of mixing, blending, pureeing and liquifying chemicals, foods, and concentrates. It is designed for use by laboratories, hospitals, and industry. A heavy-duty motor assures easy handling of viscous ingredients over long, sustained periods. Stainless steel blades and stainless steel clamp are included as standard equipment. *Testing Machines, Inc.* **E-303**

### Rotary Viscosimeter

The electric rotary viscosimeter, called the Rotovisko, measures Newtonian viscosity, intrinsic viscosity, dilatancy, thixotropy, rheopexy, yield point, and effects of temperature influences on viscosity (*i.e.*, plasticity and melting points). Some of the applications of the Rotovisko in studies of adhesives include effectiveness on application, comparison of yield, influence of evaporation on flow characteristics and swelling, dissolving, setting, and aging processes of glues.

The viscosimeter consists of the housing with control panel and the measuring head. The former incorporates the electrical circuit with indicating scale, the drive motor and reduction gears with shifting lever. The head is connected to the housing by means of an easily detachable flexible cable which makes both the electrical and mechanical connections. The measuring element of the instrument, a rotor,

spins at a defined rate while submerged in the test substance. The torque moment, which varies with the viscosity, is measured by means of a dynamometer. The results are read directly on an indicating meter, or are recorded. *Brinkmann Instruments, Inc.* **E-304**

### Velotron Pyrometer System

The Velotron Low-Range Pyrometer System is reported to measure temperatures in ranges from 0° to 200°F., and up to 1100°F. It is especially applicable, according to the manufacturer, for temperature measurement, recording and control of such products as rubber, synthetic rubber, adhesives, paper,

plastics, chemical flows, reactor kettles, web-process products, and conveyed, rolled, or extruded products. Additional features are sensitivity at low temperatures, direct-reading charts and scales, interchangeable head units, and automatic ambient temperature compensation. In operation, the pyrometer unit is sighted on the surface to be measured, by the use of an eyepiece on the unit. The thermocouple output from the pyrometer unit is the input to a Dynamaster Instrument. The instrument automatically corrects for ambient temperature and records the corrected measurement. A knob adjustment on the instrument corrects for emissivity of surface being measured. *The Bristol Co.* **E-305**

### Infra-Red Conveyor

This infra-red conveyor for heat conditioning, setting, and drying features an all-aluminum, durable alloy conveyor with oven temperatures to 500°F. It is an easily-assembled pre-fabricated unit said to be acid and corrosion-resistant and rust-proof. The controlled reflective heat offers high production and economical operation, according to the manufacturer. Additional design features are: vibrationless movement, variable speed, reversible controls, cleats for incline operation, and speeds to 100 fpm. *Mercury Industries, Inc.* **E-306**

# book reviews

**Runnerless Molding.** ***By Ernest P. Moslo. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N.Y. 5 x 7¾ in. 162 pp. $4.95.***

Every aspect of industry has in one way or another been either affected or afflicted by new and increasingly varied plastics applications. The purpose of this little book—the 17th in Reinhold's excellent Plastics Applications Series—is to present a concise description of the many techniques currently in use for the injection molding of thermoplastics without using a sprue and runner system that must be removed from the mold.

Though injection molding was first developed in Germany, after its introduction into the United States in 1932 the art underwent vast changes and improvements. Beginning with the first two-ounce machine, American manufacturers were soon producing units that were capable of handling six ounces and current models have capacities of as much as 500 ounces.

Runnerless molding—and its attendant saving in sprue scrap, labor costs and rejects—was developed as a result of the increased demand for completely automatic injection-molding machines. One of the pioneers in its perfection was Ernie Moslo, the author of this book.

In presenting his material, Mr. Moslo's idea is not to go into the design of runnerless molds, but to make it possible for the manufacturer, the moldmaker and others to understand the basic principles governing the techniques. As he points out, "The general idea of a machine modified to do a specific job is generally information enough for a good engineer."

Some of the topics covered are: materials and automatic molding machines, nozzle design variations, thin-wall container molding, multiple-cavity runnerless molds, large section runnerless molding, and valve gating for precompressed molding.

**Physical Chemistry. (Second Edition).** ***By Farrington Daniels and Robert A. Alberty. Published by John Wiley & Sons, Inc., 440 Park Ave. South, New York 16, N.Y. 6 x 9½ in. 744 pp. $8.75.***

In the second edition of this volume, which first appeared in 1955, the authors have presented their material on a somewhat more advanced level. Some of the older and more elementary material of the first edition has been eliminated and the approach has been revised to place more emphasis on mathematics. In addition, the material has been rearranged to provide an early background in fundamental thermodynamics, an understanding of which is basic to practically all that follows.

Chapters containing mostly new material are those dealing with kinetic theory, spectroscopy, and statistical mechanics. Though it is reasonably elementary in its approach, the material on statistical mechanics demonstrates how spectroscopic data lends itself to a determination of thermodynamic quantities.

Other topics of interest covered here for the first time are the mechanical properties of polymers, the "particle-in-a-box," and simple molecular orbital theory. Each chapter is provided with three sets of problems and in all there are 836 problems for private or classroom study.

The authors have both had considerable teaching experience and know how to present their material clearly and concisely. Dr. Daniels is the winner of both the Willard Gibbs Medal and the Priestly Medal for major contributions to the understanding of physical chemistry. Dr. Alberty, who is presently teaching at the University of Wisconsin, is a former Guggenheim Fellow, and in 1956 received the Eli Lilly Award in Biological Chemistry for his work on enzyme kinetics.

**Work Measurement.** ***By Virgil H. Rotroff. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N.Y. 5 x 7¾ in. 203 pp. $4.85.***

Since wages have increased in "value" as much as six times in the last one hundred years, Virgil Rotroff argues that it behooves the employer to see what means are available to him for controlling, regulating, governing, and exercising restraint and direction over work. Only by work measurement, he argues, can management establish a realistic price structure for its products.

This handy little book covers the fundamental principles and techniques of work measurement and shows how they can be applied to the current industrial scene. The author is a management engineering consultant and most of the techniques he describes were worked out in the field. He feels that work measurement can not only be a means of cost control, but can encourage employees to put their best foot forward when measurement is used as a basis for incentive wage payment.

## Trade Literature

EPOXYLITE HIGH TEMPERATURE COMPOUNDS. Five high-temperature epoxy resin formulations suitable for use in the 450° to 500°F. range are described in this eight-page booklet. Two of the formulations are potting compounds; three are adhesives. The purpose of this handbook is to elaborate on some of the properties of the epoxy-resin compounds so that designers can specify them with a minimum of evaluation time. The advantages inherent in each of the systems are described. Candid discussion of seven disadvantages, given in the introduction, serves to place these compounds in the proper perspective. The booklet contains data on field experience with high temperature compounds, design properties, and handling precautions, and offers surface preparation recommendations for epoxylite high temperature adhesives. *Epoxylite Corp.* **L-351**

DRY-WALL TAPE JOINT CEMENTS. Formulas for dry-wall tape joint cements with superior troweling and bonding qualities are given in this new technical bulletin. The bulletin points out that cements made with Adpro 444, an isolated soy protein, are outstanding in workability because of the lack of stickiness. This is said to permit smooth, easy application. In the description of Adpro 444, the literature states that the cements require only about 10 minutes standing before use when made at room temperatures of 70° to 80°F. In addition, the low water demand of the protein minimizes shrinkage but allows adequate time for smooth application before the cement sets. The bulletin also discusses the qualities of various dispersing agents. *Archer-Daniels-Midland Co.* **L-352**

MOUNT TAPE MACHINE. Information is provided on the latest method of in-line mounting of electric tape machines for production taping in a special reprint entitled "Side Mounting the Touch Button Tape Machine." According to the literature, this method used with a touch button electric taping machine adapts the horizontal flow principle to the taping of various sized shipping cartons. In addition, it adds a fourth method of positioning the taping machine to the three more commonly used methods, which are also described. *Better Packages, Inc.* **L-353**

PAPER PRESSURE-SENSITIVE TAPES. This new folder describes the versatility of paper pressure-sensitive tapes in industry, and their various physical properties. The folder, with 25 photographs, shows how Scotch brand paper tapes are used as an industrial tool for protecting, sealing, holding, general mask-

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- **Adhesive Bonding of Reinforced Plastics—H. A. Perry. $8.75.** Survey of the design and assembly of structures and products, particularly glass-fiber-reinforced plastic products, by means of adhesives. Gives data on equipment and methods used to produce adhesive bonded joints. ☐

- **Adhesive Bonding of Metals—G. Epstein. $2.95.** Considers adhesives used with metals, indicating when an adhesive-bonded joint is advantageous; the type adhesive to use; how to use it, and how to design the joint for optimum performance. ☐

- **Epoxy Resins—Their Applications and Technology—H. Lee and K. Neville. $8.00.** Guide to the field of epoxy resins, covering the chemistry of their preparation and applications, including a section on adhesives. ☐

- **Polyamide Resins—Donald E. Floyd. $4.50.** Discusses in detail various important applications of the polymers belonging to the polyamide resin family and includes a comprehensive section on adhesives. ☐

- **Principles of High Polymer Theory and Practice —A. X. Schmidt and C. A. Marlies. $14.50.** Study of the principles of high-polymer theory and practice, with a section on adhesives, their applications, and mechanisms and factors involved. ☐

- **Recent Advances in Gelatine and Glue Research —G. Stainsby (Editor). $12.00.** Study of Collagen, and its protein gelatine, comprising papers and Proceedings of an International Conference of the British Gelatine and Glue Research Association. ☐

- **Vinyl Resins—Mayo Smith. $5.75.** Surveys applications of vinyl resins with information on their types, properties, chemistry, manufacture and fabrication. Includes information on several types of adhesives in this category. ☐

- **Epoxy Resins—Irving Skeist. $5.50.** A chapter on adhesives is included in this complete study of the entire field of epoxy resins. The author gives formulations, trade names, methods of manufacture and applications. ☐

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## Trade Literature (Cont'd.)

ing, maintenance, and packaging projects. Illustrations are taken from actual case histories, and they show how die-cut paper tapes can be the answer to difficult masking or sealing jobs, and how colored and printed paper tapes can be used to instruct, inform, and identify products of all types. In addition, the five-page folder pictorially describes some of the automatic, manual, and semi-automatic machines designed to dispense and apply tapes rapid speeds. *Minnesota Mining & Mfg. Co.*
**L-354**

THE POLYMER CONSULTANT. The consultant's role in the development and testing of rubbers and plastics, for both manufacturers and users of polymeric materials is the subject of this pocket-size booklet. It contains a discussion of the economics of rental of staff and facilities for polymer research, and treats of such subjects as polymer evaluation, trouble shooting in process plants and in the field, and the development of new polymeric products. A list of report titles, suggesting some of the variety of problems solved successfully, is offered. *Foster D. Snell, Inc.*
**L-355**

ELMER'S WOOD-GLUING HANDBOOK. Instructions and helpful hints for gluing projects, from heavy construction and home improvements, to cabinet and furniture assemblies, models, toys, and sports equipment, are included in this 12-page color pamphlet. The booklet provides 45 easy-to-follow illustrations and a wood gluing chart that lists the right adhesive for practically every material and job. Of special interest to home craftsmen are illustrations for construction of beams, reinforcing gussets for framing, special joints for boat construction, furniture, cabinets and others. Also provided is a list of companies from whom woodworking plans may be obtained. *Borden Chemical Co.*
**L-356**

EPOXY-TAR PROTECTIVE COATINGS. A four-page bulletin, this publication describes a new Carbomastic epoxy-tar coating and offers a new approach to coating protection. This approach promotes the selection of coatings for a system that fits the individual requirements. A chart called "Commonly Used Carbomastic Systems" gives physical properties and details of components of the systems. *Carboline Co.*
**L-357**

DESIGNING WITH STYROFOAM. This 24 page illustrated technical bulletin, "Design of Floating Structures with Styrofoam," presents design considerations and application information based on 15 years of field experience. The bulletin contains separate sections which are devoted to a summary of flotation applications using Styrofoam, design and installation considerations, and field performance reports. *Dow Chemical Co.*
**L-358**

PANELYTE LAMINATES. This 24-page technical data brochure is designed to aid architects in the design and specification of decorative laminates. Grades, colors, sheet sizes, physical properties and performance data, and applications of Panelyte with suggested details are included in the first section. The second section lists detailed specifications for each application. *St. Regis Paper Co.*
**L-359**

**FOR MORE INFORMATION on the trade literature reviewed here, use the Reader's Service Card elsewhere in this issue.**


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# in passing

### Engineers' Salaries Up

The average total professional income of engineering teachers has increased by 14.7 percent in the past two years, according to a report by the Engineering Manpower Commission of Engineers Joint Council. The survey, made possible through a grant from The National Science Foundation, covers over 5,000 engineering teachers, or more than half the total number. Today's average basic teaching salary for engineering teachers in American colleges is $8,534. It is supplemented by an average of $2,479 from outside professional income.

In public institutions the rise in total income (15.6%) was greater than that in private institutions (12.5%) due more to higher outside earnings than to a difference in the rise of basic teaching salaries. Such outside earnings for engineering teachers in public institutions increased 24.8% during the last two years as opposed to only 11.3% in private institutions. The basic teaching salary increase was 13.4% (public) compared with 13.0% (private).

"Salaries and Income of Engineering Teachers—1960" is the title of the report. The survey was conducted in cooperation with the American Society for Engineering Education and prepared for the Manpower Commission by Professor Morris A. Horowitz of the Bureau of Business and Economic Research, Northeastern University, Boston. It is available at the Engineering Manpower Commission, 29 West 39th St., New York 18, N. Y. (25 cents for postage and handling).

### Scholarship

Webster Cement Co. of Cambridge, Mass., has inaugurated the Webtex Merit Scholarships to be administered by the National Merit Scholarship Corporation. Basically, the National Merit Scholarship Corporation Program combines a massive national talent search and a complete system of services for scholarship sponsors. The annual competition begins with a qualifying test, currently given in some 15,000 high schools. About 600,000 students take this test when they are in the second semester of the junior year. Each Merit Scholarship is composed of two outlays, an annual stipend to the student and an annual grant to the college that the student has chosen. The stipend to the student may range from $250 a year to $1,500 a year. The amount of the stipend is based upon the individual need of the student.

### First Computer?

The publication Chemical Processing points out that thirty-eight years ago, L. F. Richardson, an English mathematician, had an idea for duplicating the capabilities of present-day computers by using human beings. Mr. Richardson, who conceived the idea of numerical weather prediction, found that it took three months with the aid of a desk calculator to produce the first twenty-four hour forecast. To overcome this drawback, he suggested that 60,000 people, seated in a Hollywood Bowl arrangement, could perform the necessary calculations. Since the data could be processed serially, one calculator would perform his operation and then pass the answer on to the next person for the next computation. Page boys would transfer information from one section to another. Finally, a conductor would stand on a podium before this crowd and direct operations. Needless to say, Mr. Richardson's dream never evolved beyond the idea stage.

### Man's Best Friend

It is reported that a French citizen was sitting in his home recently awaiting some word from the police about his stolen automobile. The phone rang and a strange voice said: "I'm the man who stole your car but I don't want it. It runs badly, there is not enough gas in the tank and I'm tired of hearing your dog whimper even though I spent $1.25 for meat for him. You'll find your dog and car in front of 6 Rue d'Artois.

### Space Travel

Two obstacles to fulfillment of the man-in-space program may have been cleared by recent tests in which men have completed six-day tests in which one consumed his purified liquid metabolic waste and another group breathed their own purified oxygen. The last time we visited Aunt Millie there were plenty of comfort stations on route. It may be that Aunt Millie has it all over Mars anyway.

### Ain't It the Truth?

It was his first day on the job after vacation. "How was your trip?" asked a fellow employee. "Well," sighed the weary traveler, "have you ever spent four days in a station wagon with those you thought you loved best?"